Access DB# 78405

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: Andrew Wessman Examiner # : 78959 Date: 10/22/01
Art Unit: 1742 Phone Number 30 5-3163 Serial Number: 09/937,889
Mail Box and Bldg/Room Location: CP3 7D12 Results Format Preferred (circle): (PAPER) DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

****

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: See attached

Inventors (please provide full names): See attached

Earliest Priority Filing Date: 2/23/00

**For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.*

Please search steel composition in claims

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STAFF USE ONLY

Staff		Type of Search		Vendors and cost where applicable	
Searcher:	J	NA Sequence (#)		STN	✓ $ [redacted]
Searcher Phone #:		AA Sequence (#)	1stv	Dialog	
Searcher Location:		Structure (#)	✓	Questel/Orbit	
Date Searcher Picked Up:	10/29/01	Bibliographic	✓	Dr.Link	
Date Completed:	10/29/01	Litigation		Lexis/Nexis	
Searcher Prep & Review Time:	4 hr	Fulltext		Sequence Systems	
Clerical Prep Time:		Patent Family		WWW/Internet	
Online Time:	2 hr	Other		Other (specify)	

PTO-1590 (8-01)

EIC1700

Search Results Feedback Form (Optional)

Scientific & Technical Information Center

The search results generated for your recent request are attached. If you have any questions or comments (compliments or complaints) about the scope or the results of the search, please contact *the EIC searcher* who conducted the search *or contact*:

Kathleen Fuller, Team Leader, 308-4290, CP3/4 3D62

Voluntary Results Feedback Form

- *I am an examiner in Workgroup:* ☐ *Example:* 1713
- *Relevant prior art found, search results used as follows:*
  - ☐ 102 rejection
  - ☐ 103 rejection
  - ☐ Cited as being of interest.
  - ☐ Helped examiner better understand the invention.
  - ☐ Helped examiner better understand the state of the art in their technology.

Types of relevant prior art found:

- ☐ Foreign Patent(s)
- ☐ Non-Patent Literature
  (Journal articles, conference proceedings, new product announcements etc.)

- *Relevant prior art not found:*
  - ☐ Results verified the lack of relevant prior art (helped determine patentability).
  - ☐ Search results were not useful in determining patentability or understanding the invention.

Other Comments:

Drop off completed forms in CP3/4 - 3D62.

Andrew,

L1 and L2 are the searches done in the Reg. file for the iron alloy. Although reg. files for alloys don't keep track of amounts less than .05, there are exceptions - ASTM etc. I searched on fe/mn/si and added in the other elements in claim 1 except the nitrogen (search starts on L32). In L2 I added in the limitations of claim 3 - group A and group B (search starts on L57). The registry numbers always have to be crossed over in Chem. Abstracts (CA) before they are used.

The way the claims are drafted where it designates some amount "or less". If you assume the amount could be 0 %, since 0 % is less than 2.0 %, claim 1 isn't claiming anything except Fe. Therefore I assumed that since Si and Mn had the highest potential amounts, they should be searched on. With these results I added in the process steps (claim 6 - process) and added in the physical properties - hardness or BH, strain etc. to limit the number of answers.

There are 2 places in claims where you have mult. dependent claims dependent on another mult. dependent cl. and we discussed claim 12 yesterday regarding the V and Nb - the drafting is poor.

In Metadex, Japio and Derwent the amounts of elements can't be specified in the manner we use in the Reg. file but since the claims are drafted so broadly you may find something useful.

John

=> d his nofile

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     FILE 'REGISTRY' ENTERED AT 08:03:21 ON 30 OCT 2002
L1           874 SEA ABB=ON  PLU=ON  (AL(L)C(L)FE(L)MN(L)P(L)SI)/ELS (L)
                 7-13/ELC.SUB AND >90 FE/MAC AND < 2.1 SI/MAC AND < 3.1 MN/MAC
                 D COST                                  Group A
L2           287 SEA ABB=ON  PLU=ON  (AL(L)C(L)(CU OR NI OR CR OR MO)(L)FE(L)MN(
   Group B ---->  L)(NB OR TI OR V)(L)P(L)SI)/ELS (L) 7-13/ELC.SUB AND >90
                 FE/MAC AND < 2.1 SI/MAC AND < 3.1 MN/MAC
                 D COST

     FILE 'HCAPLUS' ENTERED AT 08:07:19 ON 30 OCT 2002
L3          3691 SEA ABB=ON  PLU=ON  L1
L4           671 SEA ABB=ON  PLU=ON  L2

L17       477065 SEA ABB=ON  PLU=ON  HARD? OR BH
L19        88419 SEA ABB=ON  PLU=ON  FERRITE? OR MARTENSITE?
L20       531316 SEA ABB=ON  PLU=ON  THICKNESS? OR WIDTH?
L21       814394 SEA ABB=ON  PLU=ON  ELECTROPLAT##### OR PLAT#####
L22              QUE ABB=ON  PLU=ON  HEAT? OR WARM? OR HOT# OR CALEFACT? OR
                 TORREFACT? OR PYROL? OR AUTOCLAV? OR THERMOL? OR THERMAL? OR
                 (HIGH## OR HEIGHTEN? OR RAIS? OR INCREAS? OR ELEVATE?)(2A)(TEMP
                 # OR TEMPERATUR?)
L23              QUE ABB=ON  PLU=ON  PRODUC? OR PROD# OR GENERAT? OR MANUF? OR
                 MFR# OR CREAT? OR FORM## OR FORMING? OR FORMAT? OR MAKE# OR
                 MADE# OR MAKING# OR FABRICAT? OR PREPAR?
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L24             QUE ABB=ON  PLU=ON  ROLL? OR FLAT? OR LEVEL?
L25     1265843 SEA ABB=ON  PLU=ON  COOL? OR QUENCH? OR CHILL? OR (REDUC? OR
                LOW? OR DECREAS?)(3A)(TEMP# OR TEMPERATUR?)
L26      605791 SEA ABB=ON  PLU=ON  SHEET? OR THIN?(2A)LAYER? OR THINLAYER? OR
                FOIL? OR LEAF?
L27      721655 SEA ABB=ON  PLU=ON  STEEL? OR (IRON OR FE)(2A)ALLOY?
L28      175567 SEA ABB=ON  PLU=ON  COIL? OR WIND?
                D QUE STAT

     FILE 'LCA' ENTERED AT 08:36:04 ON 30 OCT 2002
L29        1721 SEA ABB=ON  PLU=ON  TENSIL? OR STRAIN? OR ULTIMAT?(2A)STRENGTH?


     FILE 'HCAPLUS' ENTERED AT 08:43:37 ON 30 OCT 2002
L30      667549 SEA ABB=ON  PLU=ON  TENSIL? OR STRAIN? OR ULTIMAT?(2A)STRENGTH?
L31       41203 SEA ABB=ON  PLU=ON  L26(3A)L27
L32         489 SEA ABB=ON  PLU=ON  L3 AND L31
L33         344 SEA ABB=ON  PLU=ON  L32 AND L24
L34         244 SEA ABB=ON  PLU=ON  L33 AND L22
L35         201 SEA ABB=ON  PLU=ON  L34 AND L23
L36          84 SEA ABB=ON  PLU=ON  L35 AND L25
L37           5 SEA ABB=ON  PLU=ON  L36 AND AG#####
                D SCAN
L38          64 SEA ABB=ON  PLU=ON  L36 AND L28
L39          14 SEA ABB=ON  PLU=ON  L38 AND L17
L40          11 SEA ABB=ON  PLU=ON  L39 AND L30
L41           2 SEA ABB=ON  PLU=ON  L40 AND L20
L42           0 SEA ABB=ON  PLU=ON  L40 AND L21
L43           6 SEA ABB=ON  PLU=ON  L40 AND L19
L44           4 SEA ABB=ON  PLU=ON  L38 AND L21
L45         586 SEA ABB=ON  PLU=ON  L3 AND L24(2A)L27
L46         390 SEA ABB=ON  PLU=ON  L45 AND L22
L47         283 SEA ABB=ON  PLU=ON  L46 AND L23
L48         131 SEA ABB=ON  PLU=ON  L47 AND L25
L49          71 SEA ABB=ON  PLU=ON  L48 AND L26
L50          54 SEA ABB=ON  PLU=ON  L49 AND L28
L51          12 SEA ABB=ON  PLU=ON  L50 AND L17
L52          10 SEA ABB=ON  PLU=ON  L51 AND L30
L53           6 SEA ABB=ON  PLU=ON  L52 AND L19
L54           1 SEA ABB=ON  PLU=ON  L52 AND L20
L55           1 SEA ABB=ON  PLU=ON  L51 AND L20
L56           5 SEA ABB=ON  PLU=ON  L50 AND L20
L57          93 SEA ABB=ON  PLU=ON  L4 AND L26(3A)L27
L58          68 SEA ABB=ON  PLU=ON  L57 AND L22
L59          68 SEA ABB=ON  PLU=ON  L57 AND L22
L60          59 SEA ABB=ON  PLU=ON  L59 AND L24
L61          33 SEA ABB=ON  PLU=ON  L60 AND L25
L62          27 SEA ABB=ON  PLU=ON  L61 AND L28
L63          14 SEA ABB=ON  PLU=ON  L62 AND (L17 OR L30)
L64          11 SEA ABB=ON  PLU=ON  L63 AND L19
L65           0 SEA ABB=ON  PLU=ON  L64 AND L20
L66           1 SEA ABB=ON  PLU=ON  L64 AND L21
L67          26 SEA ABB=ON  PLU=ON  L62 AND L23
L68           6 SEA ABB=ON  PLU=ON  L67 AND L17
L69          12 SEA ABB=ON  PLU=ON  L67 AND L30
L70           9 SEA ABB=ON  PLU=ON  L69 AND L19
L71           0 SEA ABB=ON  PLU=ON  L70 AND (CARBONITRID? OR NITROCARBURI?)
L72          14 SEA ABB=ON  PLU=ON  L63 OR L66 OR L68 OR L70
L73          18 SEA ABB=ON  PLU=ON  L37 OR L41 OR L43 OR L44 OR L53 OR L54 OR
                L55 OR L56
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L74          13 SEA ABB=ON  PLU=ON  L73 NOT L72
L75          14 SEA ABB=ON  PLU=ON  L39 OR L40 OR L51 OR L52
L76           3 SEA ABB=ON  PLU=ON  L75 NOT (L73 OR L72)

     FILE 'METADEX' ENTERED AT 09:09:23 ON 30 OCT 2002
L77         383 SEA ABB=ON  PLU=ON  FE*MN*SI
L78          65 SEA ABB=ON  PLU=ON  FE*SI*MN
L79         443 SEA ABB=ON  PLU=ON  L77 OR L78
L80      446420 SEA ABB=ON  PLU=ON  L79 OR L27
L81       13342 SEA ABB=ON  PLU=ON  L80(3A)L26
L82        4934 SEA ABB=ON  PLU=ON  L81 AND L22
L83        3497 SEA ABB=ON  PLU=ON  L82 AND L23
L84        1912 SEA ABB=ON  PLU=ON  L83 AND L24
L85         565 SEA ABB=ON  PLU=ON  L84 AND L25
L86         159 SEA ABB=ON  PLU=ON  L85 AND L28
L87          29 SEA ABB=ON  PLU=ON  L86 AND L17
L88          22 SEA ABB=ON  PLU=ON  L87 AND L30
L89           9 SEA ABB=ON  PLU=ON  L88 AND L19
L90           0 SEA ABB=ON  PLU=ON  L89 AND L20
L91           0 SEA ABB=ON  PLU=ON  L89 AND L21
L92           2 SEA ABB=ON  PLU=ON  L88 AND L20
L93           0 SEA ABB=ON  PLU=ON  L89 AND L21
                D SCAN L89
                D TRIAL L89
                D TRIAL 1-9 L89
L94          11 SEA ABB=ON  PLU=ON  L89 OR L92
L95          11 SEA ABB=ON  PLU=ON  L88 NOT L94
                D TRIAL 1-11 L95

     FILE 'JAPIO' ENTERED AT 09:19:17 ON 30 OCT 2002
L96       46242 SEA ABB=ON  PLU=ON  L22(3A)L24
L97       15644 SEA ABB=ON  PLU=ON  L96 AND L27
L98       14200 SEA ABB=ON  PLU=ON  L97 AND L23
L99        5460 SEA ABB=ON  PLU=ON  L98 AND (QUENCH? OR COOL?)
L100       6204 SEA ABB=ON  PLU=ON  L98 AND L25
L101       2398 SEA ABB=ON  PLU=ON  L100 AND L26
L102       2379 SEA ABB=ON  PLU=ON  L100 AND SHEET?
L103       1112 SEA ABB=ON  PLU=ON  L102 AND L28
L104        212 SEA ABB=ON  PLU=ON  L103 AND L30
L105         38 SEA ABB=ON  PLU=ON  L104 AND L17
L106         13 SEA ABB=ON  PLU=ON  L105 AND AG#####
L107          5 SEA ABB=ON  PLU=ON  L106 AND L19
L108          0 SEA ABB=ON  PLU=ON  L106 AND L20
L109          8 SEA ABB=ON  PLU=ON  L105 AND L20
L110          4 SEA ABB=ON  PLU=ON  L106 AND L21
                D SCAN L107
L111         21 SEA ABB=ON  PLU=ON  L106 OR L107 OR L109 OR L110
                D SCAN
L112      13440 SEA ABB=ON  PLU=ON  L27 AND HOT?(2A)ROLL?
L113      12264 SEA ABB=ON  PLU=ON  L112 AND L23
L114       5423 SEA ABB=ON  PLU=ON  L113 AND L25
L115       2234 SEA ABB=ON  PLU=ON  L114 AND L26
L116       1093 SEA ABB=ON  PLU=ON  L115 AND L28
L117        146 SEA ABB=ON  PLU=ON  L116 AND L17
L118         38 SEA ABB=ON  PLU=ON  L117 AND L30
L119          9 SEA ABB=ON  PLU=ON  L118 AND L19
                D SCAN
L120          3 SEA ABB=ON  PLU=ON  L119 NOT L111
L121         24 SEA ABB=ON  PLU=ON  L111 OR L119
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     FILE 'WPIX' ENTERED AT 09:31:02 ON 30 OCT 2002
L122       32080 SEA ABB=ON  PLU=ON  L26(3A)L27
L123       12663 SEA ABB=ON  PLU=ON  L122 AND L22
L124       10602 SEA ABB=ON  PLU=ON  L123 AND L23
L125        6242 SEA ABB=ON  PLU=ON  L124 AND L24
L126        2290 SEA ABB=ON  PLU=ON  L125 AND L25
L127         780 SEA ABB=ON  PLU=ON  L126 AND L28
L128          86 SEA ABB=ON  PLU=ON  L127 AND L17
L129          22 SEA ABB=ON  PLU=ON  L128 AND L30
L130           6 SEA ABB=ON  PLU=ON  L129 AND L19
L131           2 SEA ABB=ON  PLU=ON  L129 AND L21
L132           2 SEA ABB=ON  PLU=ON  L129 AND L20
L133           9 SEA ABB=ON  PLU=ON  L130 OR L131 OR L132
L134          13 SEA ABB=ON  PLU=ON  L129 NOT L133
                 D SCAN

=> file hcaplus

FILE 'HCAPLUS' ENTERED AT 09:41:32 ON 30 OCT 2002
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=> d L72 1-14 cbib abs hitind hitrn

L72  ANSWER 1 OF 14  HCAPLUS  COPYRIGHT 2002 ACS
2002:347617   Document No. 136:328774  Hot-rolled
     steel sheet with high fatigue resistance and burring
     processability and stress-induced transformation type composite structure
     and its manufacture.  Yokoi, Tatsuo; Takahashi, Manabu; Okada,
     Hiroyuki (Nippon Steel Corp., Japan).  Jpn. Kokai Tokkyo Koho JP
     2002129285 A2 20020509, 11 pp.  (Japanese).  CODEN: JKXXAF.  APPLICATION:
     JP 2000-330190 20001030.
AB   The title steel contains C 0.01-0.3, Si 0.01-2, Mn 0.05-3, P .ltoreq.0.1,
     S .ltoreq.0.01, Al 0.005-1, and optionally .gtoreq.1 metals of Cu 0.2-2, B
     0.0002-0.002, Ca 0.0005-0.002, rare earth metals (REM) 0.0005-0.02, Ti
     0.05-0.5, Nb 0.01-0.5, Mo 0.05-1, V 0.02-0.2, Cr 0.01-1, and Zr 0.02-0.2%,
     and has a residual austenite vol. fraction of 5-25% in its microstructure
     and the balance as mainly ferrite-bainite composite structure, a
     ferrite av grain diam. of 2-20 .mu.m, an av. grain diam. ratio of
     residual austenite to ferrite at 0.05-0.8, and a carbon concn.
     of residual austenite at 0.2-3%.  Cast slabs of title steel are
     homogenized, hot rolled at (Ar3+100.degree.)-Ar3,
     settled at Ar3-Ar1 for 1-20 s, quenched at a cooling
     rate .gtoreq.20.degree./s, coiled at 350-450.degree., acid
     pickled, cold rolled at 10-40% draft, and then cooled
     to obtain final sheets with tensile strength .gtoreq.540 MPa.
IC   ICM  C22C038-00
     ICS  C21D008-02; C21D009-46; C22C038-06; C22C038-58
CC   55-11 (Ferrous Metals and Alloys)
ST   rolling steel sheet fatigue resistance
     burring processability
IT   Rolling (metals)
        (hot; steel sheet with high fatigue
        resistance and burring processability and stress-induced transformation
        type composite structure and its manuf.)
IT   145018-89-9   146540-91-2, processes   158698-47-6, processes
     222728-24-7   246235-19-8, processes   329927-43-7   415711-39-6
```

415711-40-9 415711-41-0, processes **415711-44-3**
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**hot-rolled steel sheet** with high fatigue resistance and burring processability and stress-induced transformation type composite structure and its **manuf**.)

IT **415711-44-3**
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**hot-rolled steel sheet** with high fatigue resistance and burring processability and stress-induced transformation type composite structure and its **manuf**.)

L72 ANSWER 2 OF 14 HCAPLUS COPYRIGHT 2002 ACS
2002:345102 Document No. 136:328772 **Hot-rolled steel sheet** with high fatigue resistance and burring processability and stress-induced transformation type composite structure and its **manufacture**. Yokoi, Tatsuo; Takahashi, Manabu; Okada, Hiroyuki (Nippon Steel Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2002129286 A2 20020509, 10 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-330191 20001030.

AB The title steel contains C 0.01-0.3, Si 0.01-2, Mn 0.05-3, P .ltoreq.0.1, S .ltoreq.0.01, Al 0.005-1, and optionally .gtoreq.1 metals of Cu 0.2-2, B 0.0002-0.002, Ca 0.0005-0.002, rare earth metals (REM) 0.0005-0.02, Ti 0.05-0.5, Nb 0.01-0.5, Mo 0.05-1, V 0.02-0.2, Cr 0.01-1, and Zr 0.02-0.2%, and has a residual austenite vol. fraction of 5-25% in its microstructure, and the balance as mainly **ferrite**-bainite composite structure, and an av. **hardness** ratio of residual austenite to **ferrite** at 1.5-7. Cast slabs of title steel are homogenized, **hot rolled** at (Ar3+100.degree.)-Ar3, settled at Ar3-Ar1 for 1-20 s, **quenched** at a **cooling** rate .gtoreq.20.degree./s, **coiled** at 350-450.degree., and then **cooled** to obtain final sheets with **tensile** strength .gtoreq.540 MPa.

IC ICM C22C038-00
ICS B21B003-00; C21D008-02; C21D009-46; C22C038-06; C22C038-58

CC 55-11 (Ferrous Metals and Alloys)

IT **Rolling** (metals)
(**hot**; **steel sheet** with high fatigue resistance and burring processability and stress-induced transformation type composite structure and its **manuf**.)

IT Automobiles
(parts; **hot-rolled steel sheet** with high fatigue resistance and burring processability and stress-induced transformation type composite structure and its **manuf**.)

IT 145018-89-9 146540-91-2, processes 158698-47-6, processes 222728-24-7 246235-19-8, processes 329927-43-7 415711-39-6 415711-40-9 415711-41-0, processes 415711-43-2 **415711-44-3**
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**hot-rolled steel sheet** with high fatigue resistance and burring processability and stress-induced transformation type composite structure and its **manuf**.)

IT **415711-44-3**
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**hot-rolled steel sheet** with high fatigue resistance and burring processability and stress-induced transformation type composite structure and its **manuf**.)

L72 ANSWER 3 OF 14 HCAPLUS COPYRIGHT 2002 ACS
2002:219807 Document No. 136:250797 High-**tensile steel** **sheet** with good stretch flangeability and cutting property and its **manufacture** by **hot rolling**. Nomura, Shigeki; Matsuda, Hideki (Sumitomo Metal Industries Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2002080936 A2 20020322, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-271992 20000907.

AB The **steel sheet** contains C 0.02-0.20, Si .ltoreq.2.5, Mn 0.9-2.2, P .ltoreq.0.10, S .ltoreq.0.010, Al 0.003-1.0, N 0.0010-0.020, Ti 0.01-0.40, and Sn 0.0003-0.010 wt.% satisfying Sn .gtoreq. N/15 and also contains .gtoreq.15 vol.% bainitic structure with Vickers **hardness** 150 HV. The **steel sheet** is **manufd.** by **heating** the alloy at .gtoreq.1050.degree., **hot rolling** at 780-1000.degree., **cooling** with the rate of .gtoreq.5 .degree./s, and **coiling** at 300-650.degree..

IC ICM C22C038-00
ICS C21D009-46; C22C038-14; C22C038-58

CC 55-7 (Ferrous Metals and Alloys)

ST high **tensile steel sheet** stretch flangeability; cutting property **steel sheet** **hot rolling**

IT **Rolling** (metals)
(**hot**; **manuf.** of high-**tensile** **steel sheet** with good stretch flangeability and cutting property by **hot rolling**)

IT 12427-23-5, Bainite
RL: OCU (Occurrence, unclassified); OCCU (Occurrence)
(**manuf.** of high-**tensile steel** **sheet** with good stretch flangeability and cutting property by **hot rolling**)

IT 12709-12-5, processes 58959-02-7, processes 60391-71-1, processes 72941-94-7, processes 189890-08-2, processes 223757-21-9, processes 250691-29-3, processes 250691-32-8, processes 250691-39-5, processes 404381-78-8, processes 404381-82-4, processes 404381-84-6, processes 404381-86-8, processes 404381-88-0 404381-91-5, processes 404383-59-1 **404383-60-4**
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**manuf.** of high-**tensile steel** **sheet** with good stretch flangeability and cutting property by **hot rolling**)

IT 7429-90-5, Aluminum, processes 7440-03-1, Niobium, processes 7440-31-5, Tin, processes 7440-70-2, Calcium, processes 7727-37-9, Nitrogen, processes
RL: MOA (Modifier or additive use); PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(microalloying element; **manuf.** of high-**tensile** **steel sheet** with good stretch flangeability and cutting property by **hot rolling**)

IT **404383-60-4**
RL: PEP (Physical, engineering or chemical process); PYP (Physical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**manuf.** of high-**tensile steel** **sheet** with good stretch flangeability and cutting property by **hot rolling**)

L72 ANSWER 4 OF 14 HCAPLUS COPYRIGHT 2002 ACS
2001:603763 Document No. 135:183753 High-strength **hot-rolled steel sheet** having good bake **hardenability** and impact resistance and its **manufacture**.
Ue, Isamu; Yamazaki, Takuya; Kaneko, Shinjiro; Tosaka, Akio (Kawasaki Steel Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2001226744 A2 20010821, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-36756 20000215.

AB The **steel sheet** contains C 0.01-0.16, Si .ltoreq.2.0, Mn .ltoreq.3.0, P 0.005-0.2, Al 0.001-0.1, N >0.0060 and .ltoreq.0.0200 including solid.-soln. N 0.0030-0.0100% and has **ferrite** crystal structure with av. grain size .ltoreq.7.0 .mu.m, **tensile** strength 440-840 MPa, and **strain** aging factor (defined by the author) >80 MPa. Optionally, the **steel sheet** contains Ti 0.001-0.1, Nb 0.001-0.1, Ni 0.1-1.5, Cr 0.1-1.5, and/or Mo 0.1-1.5. The sheet is **manufd.** by **heating** a steel slab contg. the above compn. at 950-1250.degree., rough **rolling**, finish **rolling** with total draft of final 3 passes 15-65% and finish temp. (FDT) (Ar3 + 10.degree.) to (Ar3 + 100.degree.), **cooling** at .gtoreq.20.degree./s within 0.5 s from final **rolling**, and then **coiling** at 600-300.degree.. The sheet is esp. suitable for automotive interior.

IC ICM C22C038-00
ICS C21D009-46; C22C038-06; C22C038-58

CC 55-11 (Ferrous Metals and Alloys)

ST **hot rolling** steel bake **hardenability** impact strength

IT **Cooling**
(high-strength **hot-rolled** steel **manufd.** by **rolling** and **cooling** for bake **hardenability** and impact resistance)

IT **Rolling** (metals)
(**hot**; high-strength **hot-rolled** steel **manufd.** by **rolling** and **cooling** for bake **hardenability** and impact resistance)

IT 50953-08-7, processes 60391-71-1, processes 67940-03-8, processes 97982-62-2, processes 126562-48-9, processes 163552-56-5, processes 196699-81-7, processes 355373-98-7, processes 355373-99-8, processes 355374-00-4, processes **355374-01-5**
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(high-strength **hot-rolled** steel **manufd.** by **rolling** and **cooling** for bake **hardenability** and impact resistance)

IT 12427-24-6P, **Ferrite** (ferrous metal component)
RL: PNU (Preparation, unclassified); TEM (Technical or engineered material use); PREP (Preparation); USES (Uses)
(high-strength **hot-rolled** steel **manufd.** by **rolling** and **cooling** for bake **hardenability** and impact resistance)

IT 7727-37-9, Nitrogen, uses
RL: MOA (Modifier or additive use); USES (Uses)
(microalloying element; high-strength **hot-rolled** steel **manufd.** by **rolling** and **cooling** for bake **hardenability** and impact resistance)

IT **355374-01-5**
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(high-strength **hot-rolled** steel **manufd.** by **rolling** and **cooling** for bake

hardenability and impact resistance)

L72 ANSWER 5 OF 14 HCAPLUS COPYRIGHT 2002 ACS
2000:573570 Document No. 133:180843 Microalloyed steel for **hot-rolled** strip having high strength, and suitable for automotive-body applications. Kaneko, Sinjiro; Shimizu, Tetsuo; Furukimi, Osamu (Kawasaki Steel Corporation, Japan). Eur. Pat. Appl. EP 1028167 A2 20000816, 18 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2000-101397 20000125. PRIORITY: JP 1999-31353 19990209.

AB The microalloyed steel for high-strength strip having good paint-bake **hardenability** and resistance to fatigue, crash loading, and room-temp. aging contains C 0.01-0.12, Si .ltoreq.2.0, Mn 0.01-3.0, P .ltoreq.0.2, Al 0.001-0.1, and N 0.003-0.02%, optionally with Ti 0.001-0.1, Nb 0.001-0.1, Ni 0.1-1.5, Cr 0.1-1.5, and/or Mo 0.1-1.5%. The steel ingot slab is preheated at 1000-1300.degree. and is **hot rolled** with finishing at 10-100.degree. above the Ar3 point, followed by immediate **cooling** at .apprx.50.degree./s and **coiling** at 350-600.degree.. The **hot-rolled** sheet has the microstructure with ferrite having the av. grain size of .ltoreq.8 .mu.m, and minor phases with pearlite, bainite, martensite, and/or retained austenite. The solute N in the ferrite is 0.003-0.01%, and the ratio of av. N dissolved in the ferrite grain boundary to an av. N concn. in ferrite grains is 100-10,000. The typical steel for the **hot-rolled** sheet having ferrite-pearlite microstructure contains C 0.07, Si 0.12, Mn 1.20, P 0.015, Al 0.030, N 0.012, and S 0.003%. The **hot-rolled** sheet shows **tensile** strength of 489 MPa, yield point 373 MPa, and elongation 29.6%, with the **tensile** strength increased by paint-bake treatment to 551 MPa.

IC ICM C21D008-02
ICS C22C038-06

CC 55-3 (Ferrous Metals and Alloys)
Section cross-reference(s): 42

ST microalloyed **steel sheet** automobile body; **steel** ferritic **sheet hardening** paint bake

IT Coating process
(bake-paint; steel for **hot-rolled** strip with bake-paint strength for automotive-body applications)

IT Automobiles
(bodies, microalloyed steel for; steel for **hot-rolled** strip having high strength for automotive-body applications)

IT 12597-69-2, Steel, uses 50953-08-7, uses 60391-71-1, uses 97982-62-2, uses 121569-05-9, uses 126562-48-9, uses 150590-22-0, uses 197370-19-7 **288371-82-4** 288371-83-5, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(microalloyed; steel for **hot-rolled** strip having high strength for automotive-body applications)

IT 7727-37-9, Nitrogen, uses
RL: MOA (Modifier or additive use); USES (Uses)
(steel microalloyed with; steel for **hot-rolled** strip having high strength for automotive-body applications)

IT **288371-82-4**
RL: TEM (Technical or engineered material use); USES (Uses)
(microalloyed; steel for **hot-rolled** strip having high strength for automotive-body applications)

L72 ANSWER 6 OF 14 HCAPLUS COPYRIGHT 2002 ACS
1999:439697 Document No. 131:119009 High-strength and high-processibility **hot-rolled steel sheet** with good

fatigue resistance and hole expandability. Furukimi, Osamu; Morita, Masahiko; Takagi, Shusaku; Miura, Kazuya; Ohara, Takashi (Kawasaki Steel Corp., Japan). Jpn. Kokai Tokkyo Koho JP 11189842 A2 19990713 Heisei, 11 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1998-168720 19980616. PRIORITY: JP 1997-292485 19971024.

AB The title sheet consists of C 0.05-0.40, Si 1.0-3.0, Mn 0.6-3.0, Cr 0.2-2.0, Ti 0.005-0.25, Nb 0.003-0.1, and V 0.003-0.1%. Primary ferrite is the main phase, martensite, needle ferrite, and retained austenite are 2nd phases. The Vickers **hardness** of the main phase is .gtoreq.180, and the difference in **hardness** between the main phase and 2nd phases is .ltoreq.200. The sheet is **manufd** by **heating** to 1050-1150.degree.. rough **rolling**, finish **rolling** at 780-980.degree., **cooling** to 620-780.degree., holding at the same temp. for 1-10 s or gradually **cooling** at .ltoreq.20.degree./s, **cooling** to 350-500.degree., **coiling**, and **cooling** to .ltoreq.300.degree. at 10-100.degree./h.

IC ICM C22C038-00
ICS C21D009-46; C22C038-38

CC 55-3 (Ferrous Metals and Alloys)

IT Fatigue, mechanical
Hardness (mechanical)
Strength
(high-strength and high-processibility **hot-rolled steel sheet** with good fatigue resistance and hole expandability)

IT 12173-93-2, Martensite, **formation** (nonpreparative)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(2nd phase; high-strength and high-processibility **hot-rolled steel sheet** with good fatigue resistance and hole expandability)

IT 232590-61-3 232590-62-4 232590-63-5 232590-64-6, processes
232590-65-7 232590-66-8 232590-67-9
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(high-strength and high-processibility **hot-rolled steel sheet** with good fatigue resistance and hole expandability)

IT 12427-24-6, Ferrite (ferrous metal component)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(main phase; high-strength and high-processibility **hot-rolled steel sheet** with good fatigue resistance and hole expandability)

IT 12244-31-4, Austenite, **formation** (nonpreparative)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(retained, 2nd phase; high-strength and high-processibility **hot-rolled steel sheet** with good fatigue resistance and hole expandability)

IT **232590-65-7**
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(high-strength and high-processibility **hot-rolled steel sheet** with good fatigue resistance and hole expandability)

L72 ANSWER 7 OF 14 HCAPLUS COPYRIGHT 2002 ACS
1997:664430 Document No. 127:361357 High-strength **hot rolled steel sheets** having high pitting corrosion resistance and excellent formability, high-strength **steel sheets** having zinc-base coatings, and their

preparation. Tanaka, Fukuteru; Iwatani, Jiro; Yamamoto, Takayuki (Kobe Steel, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 09263883 A2 19971007 Heisei, 10 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1996-74522 19960328.

AB The title **steel sheets** contg. C 0.05-0.25; Mn 1.0-3.0; P 0.01-0.12; Ti 0.02-0.5; Al 0.01-0.1; S .ltoreq.0.01; N .ltoreq.0.01; solute Ti 0.001-0.25; and optionally (A) Si 0.01-2.0, Nb 0.005-0.05, V 0.005-0.05, Zr 0.005-0.05, Mo 0.1-1.0, and/or W 0.01-2.0; (B) Cr 0.1-2.0; (C) Cu 0.05-1.0; (D) Ni 0.05-1.0; (E) B 0.0003-0.0060; and (F) Ca 0.0004-0.010 and/or rare earth metals 0.0004-0.010 wt.%; have **tensile** strength .gtoreq.500 N/mm2 and structures contg. 16-70 vol.% **ferrite** and .gtoreq.1 selected from **martensite**, tempered **martensite**, and bainite. Steels of the claimed compns. are treated by **hot rolling** by finishing at .gtoreq.800.degree., **cooling** to .ltoreq.650.degree. by av. **cooling** rate 5-30.degree./s, and **coiling** to give the title sheets. The title **steel sheets** may be treated by **electroplating** with Zn-base coatings, and optionally chromating followed by coating org. films. Alternatively, the title **steel sheets** may be treated by **heating** at 420-650.degree. in annealing furnaces of continuously **hot** galvanizing, **hot**-dip galvanizing at 420-500.degree., **cooling** to .ltoreq.450.degree. by av. **cooling** rate .gtoreq.5.degree./s, and optionally alloying the galvanized layers. The title sheets have low yield ratio and excellent formability.

IC ICM C22C038-00
ICS C22C038-00; C21D008-02; C21D009-46; C22C038-14; C22C038-58; C23C002-06; C23C028-00; C25D005-26

CC 55-3 (Ferrous Metals and Alloys)
Section cross-reference(s): 56

ST **steel sheet** pitting corrosion resistance; galvanized **steel sheet** pitting corrosion resistance; zinc **electroplating steel sheet** pitting anticorrosion

IT Galvanizing
(electrogalvanizing; **prepn**. of **hot rolled** (Zn-**plated**) **steel sheets** having pitting corrosion resistance)

IT Alloying
(galvanized layer; **prepn**. of **hot rolled** (Zn-**plated**) **steel sheets** having pitting corrosion resistance)

IT Galvanizing
(**hot**-dip; **prepn**. of **hot rolled** (Zn-**plated**) **steel sheets** having pitting corrosion resistance)

IT Coating process
(painting; **prepn**. of **hot rolled** (Zn-**plated**) **steel sheets** having pitting corrosion resistance)

IT Corrosion-resistant materials
(pitting; **prepn**. of **hot rolled** (Zn-**plated**) **steel sheets** having pitting corrosion resistance)

IT Chromating
(**prepn**. of **hot rolled** (Zn-**plated**) **steel sheets** having pitting corrosion resistance)

IT 12173-93-2, **Martensite**, uses 12427-23-5, Bainite 12427-24-6, **Ferrite** (ferrous metal component)
RL: TEM (Technical or engineered material use); USES (Uses)

(in **hot rolled** (Zn-**plated**) **steel sheets** having pitting corrosion resistance)

IT 7440-03-1, Niobium, uses 7440-33-7, Tungsten, uses 7440-42-8, Boron, uses 7440-45-1, Cerium, uses 7440-62-2, Vanadium, uses 7440-67-7, Zirconium, uses 7440-70-2, Calcium, uses 8049-20-5, Misch metal
RL: MOA (Modifier or additive use); USES (Uses)
(microalloying element; **prepn.** of **hot rolled** (Zn-**plated**) **steel sheets** having pitting corrosion resistance)

IT 37379-34-3, processes 51401-11-7, processes 111235-79-1 188053-50-1 188053-51-2, processes 188053-52-3, processes 188053-53-4, processes 188053-54-5, processes 188053-55-6, processes 188053-56-7, processes 188053-57-8, processes 188053-58-9, processes 188053-59-0, processes 188053-60-3, processes 188053-61-4, processes 188053-63-6, processes 198565-63-8
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**prepn.** of **hot rolled** (Zn-**plated**) **steel sheets** having pitting corrosion resistance)

IT 188053-64-7 **198565-64-9**
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**prepn.** of **hot rolled** (Zn-**plated**) **steel sheets** having pitting corrosion resistance)

IT **198565-64-9**
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**prepn.** of **hot rolled** (Zn-**plated**) **steel sheets** having pitting corrosion resistance)

L72 ANSWER 8 OF 14 HCAPLUS COPYRIGHT 2002 ACS

1995:947445 Document No. 124:62735 **Manufacture** of corrosion-resistant and **hot-rolled tensile steel sheets** with high ductility. Imai, Norio; Komatsubara, Nozomi; Nagamichi, Tokiaki (Sumitomo Metal Ind, Japan). Jpn. Kokai Tokkyo Koho JP 07242947 A2 19950919 Heisei, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1994-32303 19940302.

AB Steels contg. C 0.05-0.25, Si .ltoreq.2.5, sol. Al .ltoreq.2.5, Mn 0.8-2.5, Cu 0.10-0.80, P 0.020-0.15, and Ni 0.01-0.50% with Si + Al .gtoreq.1.0% are **heated** to 1000-1100.degree., immediately roughly **hot rolled** at draft .gtoreq.50% at 880-940.degree., finish **rolled** at draft .gtoreq.60% at 780-840.degree., **cooled** to 300-450.degree. at 10-50.degree./s, and then **coiled** to give the sheets comprising .gtoreq.5 vol.% polygonal **ferrite**-based structures contg. retained austenite. Optionally, the steels contain (1) Ca 0.0002-0.0100, Zr 0.01-0.10, and/or rare earth metals 0.002-0.10 wt.% and/or (2) Nb 0.005-0.10, Ti 0.005-0.10, and/or V 0.005-0.20%. The sheets are useful for structural parts of automobiles and machines.

IC ICM C21D009-46
ICS C21D008-02; C22C038-00; C22C038-16

CC 55-3 (Ferrous Metals and Alloys)

ST corrosion resistance **hot rolled** steel; ductility **steel sheet**

IT 171892-97-0 171892-98-1 171892-99-2 171893-00-8 171893-01-9 171893-02-0 171893-03-1 171893-04-2 **171893-05-3** 171893-06-4 171893-07-5 171893-08-6 171893-09-7 171893-10-0 171893-11-1 171893-12-2 171893-13-3 171893-14-4 171893-15-5 171893-16-6 172202-70-9
RL: PEP (Physical, engineering or chemical process); PROC (Process)

(**manuf**. of corrosion-resistant and **hot-rolled tensile** steels with high ductility)
IT 12427-24-6P, **Ferrite** (ferrous metal component)
RL: PNU (Preparation, unclassified); PREP (Preparation)
(polygonal; **manuf**. of corrosion-resistant and **hot-rolled tensile** steels with high ductility)
IT 12244-31-4P, Austenite, **preparation**
RL: PNU (Preparation, unclassified); PREP (Preparation)
(retained; **manuf**. of corrosion-resistant and **hot-rolled tensile** steels with high ductility)
IT **171893-05-3**
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(**manuf**. of corrosion-resistant and **hot-rolled tensile** steels with high ductility)

L72 ANSWER 9 OF 14 HCAPLUS COPYRIGHT 2002 ACS
1995:261545 Document No. 122:139399 **Hot-rolled steel sheets** with excellent fatigue strength and their **manufacture**. Kurita, Masato; Nomura, Shigeki (Sumitomo Metal Ind, Japan). Jpn. Kokai Tokkyo Koho JP 06264185 A2 19940920 Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1993-72818 19930309.
AB The process comprises casting steels contg. C 0.02-0.08, Si <1.5, Mn 0.5-2.0, Ti 0.02-0.20, P 0.005-0.06, sol. Al 0.01-0.10, S .ltoreq.0.015, Cr 0.2-1.0. and Mo 0.2-1.0%, optionally reheating at .gtoreq.1100.degree., **hot rolling** the slabs, finishing the **rolling** at a **temp. higher** than Ar3-50.degree. at the final pass exit side, **cooling** to 550-650.degree. with a **cooling** rate of 1-50.degree./s, then **coiling** the sheets to give **ferrite** structures contg. 5-15 vol.% **martensite**, .gtoreq.0.28 of (Vickers **hardness** of the **ferrite**)/(**tensile** strength of the sheets), and a **tensile** strength 500-900 MPa. The sheets are useful for automobile wheels.
IC ICM C22C038-00
ICS C21D008-02; C22C038-28
CC 55-11 (Ferrous Metals and Alloys)
ST steel **hot rolling** automobile wheel
IT Wheels
(automotive, **cooling** speed control in **manuf**. of **ferrite**- and **martensite**-contg. **steel sheets** for automobile wheels)
IT 12173-93-2P, **Martensite, preparation**
RL: IMF (Industrial manufacture); PREP (Preparation)
(**cooling** rate control in **manuf**. of **ferrite** - and **martensite**-contg. **steel sheets** for automobile wheels)
IT 160913-97-3 160913-98-4 160913-99-5, processes 160914-00-1, processes 160914-01-2, processes **161075-76-9**
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**cooling** rate control in **manuf**. of **ferrite** - and **martensite**-contg. **steel sheets** for automobile wheels)
IT 12427-24-6P, **Ferrite** (ferrous metal component)
RL: IMF (Industrial manufacture); PREP (Preparation)
(**cooling** speed control in **manuf**. of **ferrite** - and **martensite**-contg. **steel sheets** for automobile wheels)
IT **161075-76-9**
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)

(**cooling** rate control in **manuf.** of **ferrite** - and **martensite**-contg. **steel sheets** for automobile wheels)

L72 ANSWER 10 OF 14 HCAPLUS COPYRIGHT 2002 ACS
1995:212600 Document No. 122:61025 **Manufacture** of high-strength **hot-rolled steel sheets** with high workability. Nomura, Shigeki; Fukuyama, Harunari (Sumitomo Metal Ind, Japan). Jpn. Kokai Tokkyo Koho JP 06240356 A2 19940830 Heisei, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1993-45930 19930210.

AB Steel slabs contg. C 0.03-0.11, Si .ltoreq.1.7, Mn 0.8-2.0, Cr 0.2-0.9, P 0.005-0.06, sol. Al 0.01-0.10, Ti 0.03-0.12, and N 0.0025-0.0120% are **hot rolled** at finish temp. 880-960.degree.; **cooled** in 3 steps, (1) **cooling** to 600-700.degree. at 20-80.degree./s, (2) air **cooling** for 1-10 s, and (3) **cooling** to 350-550.degree. at 20-100.degree./s; and **coiled** to give **steel sheets** having composite structure of polygonal **ferrite** and 15-60 vol.% bainite and having **tensile** strength .gtoreq.640 N/mm2. Optionally, the slabs contain Ca 0.0002-0.01%, Zr 0.01-0.10%, and .gtoreq.1 rare earth metals 0.002-0.10%. The sheets are useful for automobile bodies.

IC ICM C21D008-02
ICS C21D009-46; C22C038-00; C22C038-38

CC 55-5 (Ferrous Metals and Alloys)

ST **hot rolled steel sheet** workability

IT Metalworking
(**manuf.** of workable **steel sheets** having polygonal **ferrite**-bainite structure and high strength)

IT Automobiles
(bodies, **manuf.** of workable **steel sheets** having polygonal **ferrite**-bainite structure and high strength)

IT **160170-12-7**
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**manuf.** of workable **steel sheets** having polygonal **ferrite**-bainite structure and high strength)

IT 12427-23-5P, Bainite
RL: PNU (Preparation, unclassified); PRP (Properties); PREP (Preparation)
(**manuf.** of workable **steel sheets** having polygonal **ferrite**-bainite structure and high strength)

IT 12427-24-6P, **Ferrite** (ferrous metal component)
RL: PNU (Preparation, unclassified); PRP (Properties); PREP (Preparation)
(polygonal; **manuf.** of workable **steel sheets** having polygonal **ferrite**-bainite structure and high strength)

IT **160170-12-7**
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**manuf.** of workable **steel sheets** having polygonal **ferrite**-bainite structure and high strength)

L72 ANSWER 11 OF 14 HCAPLUS COPYRIGHT 2002 ACS
1994:584487 Document No. 121:184487 **Hot-rolled steel sheets** with excellent fatigue strength and their **manufacture**. Kurita, Masato; Toyama, Kazuo; Nomura, Shigeki (Sumitomo Metal Ind, Japan). Jpn. Kokai Tokkyo Koho JP 06128688 A2 19940510 Heisei, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1992-306245 19921020.

AB The **steel sheets** contg. C 0.02-0.08, Si 1.5-2.5, Mn 0.5-2.0, P 0.005-0.06, sol. Al 0.01-0.10, S .ltoreq.0.015, Cr 0.2-1.0 and/or Mo 0.2-1.0, and Ni and/or Ti .ltoreq.0.1% and having composite

metal structures consisting of 5-15 vol.% **martensite** and balance **ferrite**, where Vicker's **hardness** (HV)/**tensile** strength (MPa) of **hot-rolled steel sheets** .gtoreq.0.27 and **tensile** strength 500-800 MPa are **manufd.** from steel slabs from cast process by optionally **heating** at .gtoreq.1100.degree., **hot rolling** at finish temp. .gtoreq.(Ar3 - 50).degree., **cooling** at 1-50.degree./s to 400-600.degree., and **coiling**. The sheets are esp. useful for machine structures, e.g., automobile wheels.

IC ICM C22C038-00
ICS C21D008-02; C21D009-48; C22C038-38

CC 55-11 (Ferrous Metals and Alloys)

ST fatigue strength steel **hot rolling**; **martensite** **ferrite steel sheet**; automobile wheel **steel sheet**

IT Wheels
(automotive, **steel sheets** for, for fatigue strength)

IT 157769-24-9 157769-25-0 157769-26-1 157769-27-2 157769-28-3 157769-29-4 157769-30-7 157769-31-8 157769-32-9 **157811-91-1**
RL: USES (Uses)
(**hot rolled** sheets of, for fatigue strength)

IT 12173-93-2, **Martensite**, properties
RL: PRP (Properties)
(**steel sheets** contg. **ferrite** and, for fatigue strength)

IT 12427-24-6, **Ferrite** (ferrous metal component)
RL: USES (Uses)
(**steel sheets** contg. **martensite** and, for fatigue strength)

IT **157811-91-1**
RL: USES (Uses)
(**hot rolled** sheets of, for fatigue strength)

L72 ANSWER 12 OF 14 HCAPLUS COPYRIGHT 2002 ACS

1994:538711 Document No. 121:138711 High-strength **steel sheets** with ductility and resistance to delayed fracture after **hot rolling**. Tosaka, Akio; Saeki, Makoto; Kato, Toshuki (Kawasaki Steel Co, Japan). Jpn. Kokai Tokkyo Koho JP 06145894 A2 19940527 Heisei, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1992-295886 19921105.

AB The sheets having bainitic microstructure (contg. bainite .gtoreq.70, bainite and tempered **martensite** .gtoreq.90, and residual austenite .ltoreq.4% by area) are **manufd.** from the microalloyed steels contg. C 0.05-0.20, Mn 1.50-3.50, P 0.02-0.08, Al .ltoreq.0.10, Cu 0.10-1.0, Cr 0.05-1.0, B 0.0010-0.0050, Nb 0.005-0.040, S .ltoreq.0.0030, Ni 0.05-1.0, and optionally Ti 0.005-0.10, Si 0.05-0.50, and/or V 0.010-0.10% with the Cu/Ni ratio <2. The steel ingot slab is **hot rolled** with preheating at .gtoreq.1100.degree. and finishing at 800-950.degree., and the resulting sheet is **cooled** at .gtoreq.30.degree./s in the 400-750.degree. range followed by **coiling** at 200-400.degree.. The **steel sheets** show **tensile** strength .gtoreq.120 kg/mm2 and the yield/**tensile** strength ratio .ltoreq.0.70, and are suitable for automobile body panels.

IC ICM C22C038-00
ICS C21D008-04; C22C038-54; C23C002-06

CC 55-11 (Ferrous Metals and Alloys)

ST **steel** microalloying **sheet** strength panel; automobile panel **steel** bainite **sheet**

IT 156947-01-2 157376-36-8 157376-37-9 157376-38-0 157376-39-1
157376-40-4 157421-30-2 **157421-31-3**
RL: USES (Uses)
(sheet, **manuf.** with **hot rolling** of, with
microstructure control for panel formability)
IT **157421-31-3**
RL: USES (Uses)
(sheet, **manuf.** with **hot rolling** of, with
microstructure control for panel formability)

L72 ANSWER 13 OF 14 HCAPLUS COPYRIGHT 2002 ACS
1993:25723 Document No. 118:25723 Manufacture of high-strength galvanized **steel sheets** with high elongation. Miyahara, Motoyuki; Tanaka, Fukuteru; Miyoshi, Tetsuji (Kobe Steel, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 04128320 A2 19920428 Heisei, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1990-249542 19900919.
AB The title **sheets** are manufd. from **steel** contg. C 0.06-0.3, Si .ltoreq.0.6, Mn 0.6-3, P .ltoreq.0.1, Al .ltoreq.0.1%, optionally Mo 0.1-1.5, Cr 0.1-1.5, and/or V 0.1-1.5%, by **hot rolling**, pickling, and cold-**rolling**. The cold-**rolled** sheets are recrystn. annealed atAc1-900.degree., **cooled** to 500-650.degree. at <20.degree./s, and further **cooled** to the galvanizing bath temp. at a **cooling** rate (CR) above that detd. by lnCR=-1.18Meq+3.37, where Meq=Mn+1.52Mo+1.10Cr+0.10Si+2.1P, and galvanized. Optionally, the galvanized sheets are soln. treated at 500-750.degree. and **cooled** to <Ms temp. at a **cooling** rate above the crit. value. Thus, steel slabs 20 mm thick were **hot rolled** at 850.degree. to a thickness of 3.2 mm and **coiled** at 560.degree.. After pickling, the sheets were cold **rolled** to 1.2 mm (a redn. of 62.5%) and galvanized at 460.degree.. The sheets had a compact coating, high punch rate, **tensile** strength of .gtoreq.60 kg/mm2, and elongation of .gtoreq.22%.
IC ICM C21D009-46
ICS C21D008-02; C22C038-00; C22C038-06; C23C002-06
CC 55-6 (Ferrous Metals and Alloys)
ST **steel sheet** galvanizing elongation
IT Galvanization
(**hot**-dip, of **steel sheets**, recrystn. annealing in, for high elongation)
IT 7440-66-6 12597-69-2
RL: USES (Uses)
(galvanization, **hot**-dip, of **steel sheets**, recrystn. annealing in, for high elongation)
IT 39425-88-2, properties 145033-79-0, miscellaneous 145033-81-4, miscellaneous 145033-85-8 145033-92-7 145135-99-5, miscellaneous 145136-00-1, miscellaneous 145136-01-2, miscellaneous **145136-02-3**
RL: PRP (Properties)
(galvanizing of, recrystn. annealing in, for high elongation)
IT **145136-02-3**
RL: PRP (Properties)
(galvanizing of, recrystn. annealing in, for high elongation)

L72 ANSWER 14 OF 14 HCAPLUS COPYRIGHT 2002 ACS
1986:210984 Document No. 104:210984 Low yield ratio high-strength **steel sheet** having good ductility and resistance to secondary cold-work embrittlement. Hashiguchi, Koichi; Tosaka, Akio; Irie, Toshio; Takahashi, Isao (Kawasaki Steel Corp., Japan). Can. CA 1200473 A1 19860211, 29 pp. (English). CODEN: CAXXA4. APPLICATION: CA

1984-451862 19840412.
AB A low-cost steel for vehicle bumpers and door guards is manufd., and has low yield/strength ratio, high **tensile** strength, excellent ductility, good spot weldability, and resistance to secondary cold work embrittlement. The steel contains C 0.02-0.15, Mn 0.2-3.5, P 0.03-0.15, Al .ltoreq. 0.10, and optionally .gtoreq.1 of Si 0.1-1.5, Cr 0.1-1.0, Mo 0.1-1.0, Nb 0.01-0.1, Ti 0.01-0.2, V 0.01-0.2%, and B 5-100 ppm. The steel is annealed by **heating** at Ac1 temp. to 950.degree. for 10 s to 10 min, and **cooling** from 600.degree. to 300.degree. at rate of 15-200.degree./s (above crit. **cooling** rate). Thus, steel (contg. C 0.08, Si 0.04, Mn 1.5, P 0.12, and Al 0.03%) was **hot rolled** into strip 0.7 mm thick, **coiled** at 540.degree., annealed at 770.degree. for 60 s, and **quenched** at 30.degree./s. The resulting steel had yield strength 37.2, **tensile** strength 65.3 kg/mm2, yield/strength ratio 57%, and elongation 24%. Conventional treatment with **quenching** at 2.degree./s resulted in 42.0, 53.8 kg/mm2, 78.1%, and 28% resp.
IC ICM C21D001-26
CC 55-5 (Ferrous Metals and Alloys)
IT Vehicles
(bumpers, steel for, **heat** treatment of)
IT 85266-22-4, uses and miscellaneous 102350-72-1, properties
102383-11-9 102383-12-0, properties
RL: USES (Uses)
(**heat** treatment of, low yield point and high strength by)
IT **102383-11-9**
RL: USES (Uses)
(**heat** treatment of, low yield point and high strength by)

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L74 ANSWER 1 OF 13 HCAPLUS COPYRIGHT 2002 ACS
2001:793686 Document No. 135:347418 Ferritic **steel sheets** having good shape freezing property and their **manufacture** by **hot rolling**. Yoshinaga, Naoki; Takahashi, Manabu; Sugiura, Natsuko; Yoshida, Toru (Nippon Steel Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2001303175 A2 20011031, 14 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2000-124774 20000425.
AB In the ferritic **steel sheets**, the mean value of x-ray random intensity ratios of {100} <011> ~ {223} <110> orientation group in the **plate** face at 1/2 **sheet thickness** is .gtoreq.3.0; the mean value of x-ray random intensity ratios in 3 crystal orientations of {554} <225>, {111} <112> and {111} <110> is .ltoreq.3.5; at least one of the r value in the **rolling** direction and the r value in the direction perpendicular to the **rolling** direction is .ltoreq.0.7. The ferritic **steel sheets** are **manufd.** by **hot rolling steel** having the above compn. with .gtoreq.25% draft in the temp. range from Ar3 transformation temp. to Ar3+100.degree. at a finish **rolling** temp. of .gtoreq.Ar3, **cooling** and **coiling** at a **temp. lower** than the crit. **temp.** To (defined in terms of steel compn.).
IC ICM C22C038-00
ICS C22C038-00; B21B003-00; C21D009-46; C22C038-06; C22C038-58
CC 55-11 (Ferrous Metals and Alloys)
ST ferritic **steel sheet hot rolling** shape freezing property
IT **Rolling** (metals)
(**hot**; ferritic **steel sheets** having good

shape freezing property and their **manuf.** by **hot rolling**)

IT 12700-72-0, processes 12713-90-5, processes 12716-17-5, processes 12727-73-0, processes 12753-98-9, processes 12761-19-2, processes 68338-75-0, processes 71390-16-4, processes 72725-51-0, processes 73380-33-3, processes 77109-14-9, processes 81876-88-2, processes 136973-73-4 143195-42-0, processes 145076-69-3, processes 303157-92-8, processes 371790-03-3, processes 371790-04-4, processes 371790-05-5, processes 371790-06-6, processes 371790-07-7, processes 371790-08-8 371790-09-9 371790-10-2 **371790-11-3** 371790-12-4 **371790-13-5**
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(ferritic **steel sheets** having good shape freezing property and their **manuf.** by **hot rolling**)

IT **371790-11-3 371790-13-5**
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(ferritic **steel sheets** having good shape freezing property and their **manuf.** by **hot rolling**)

L74 ANSWER 2 OF 13 HCAPLUS COPYRIGHT 2002 ACS

2001:320165 Document No. 134:314196 **Hot**-dip galvanized **steel sheet** having high strength and good formability and **plating** ability. Osawa, Kazunori; Sakata, Kei; Furukimi, Osamu; Suzuki, Yoshitsugu; Shinohara, Akio (Kawasaki Steel Corporation, Japan). PCT Int. Appl. WO 2001031077 A1 20010503, 30 pp. DESIGNATED STATES: W: AU, CA, CN, KR, US; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE. (Japanese). CODEN: PIXXD2. APPLICATION: WO 2000-JP7115 20001013. PRIORITY: JP 1999-300739 19991022; JP 2000-211028 20000712.

AB A **hot**-dip galvanized **steel sheet** having high strength and good formability and **plating** ability contains C 0.01-0.20, Si .ltoreq.1.0, Mn >1.5 to .ltoreq.3.0, P .ltoreq.0.10, S .ltoreq.0.05, Al .ltoreq.0.10, N .ltoreq.0.010, and Ti + V + Nb 0.010-1.0%. The surface area ratio and the av. grain size of the ferrite phase is .gtoreq.50% and .ltoreq.10 .mu.m, resp. The thickness of the band-like structure consisting of the 2nd band is Tb/T .ltoreq.0.005 (where Tb is an av. thickness of the band-like structure in the thickness direction, T is a **steel sheet** thickness). The sheet is **manufd.** by **hot rolling, coiling** at 450-750.degree., cold **rolling**, reheating to T1 .gtoreq.750.degree., and **hot**-dip galvanizing during **cooling** from T1. The galvanized sheet is suitable for automobiles and the like.

IC C22C038-00; C21D009-46

CC 55-11 (Ferrous Metals and Alloys)

ST galvanization **hot** dip steel strength formability microstructure

IT Microstructure
(**hot**-dip galvanized **steel sheet** having high strength and good formability and **plating** ability)

IT Galvanizing
(**hot**-dip; **hot**-dip galvanized **steel sheet** having high strength and good formability and **plating** ability)

IT 37379-34-3, properties 60396-42-1, properties 79121-69-0, properties 126185-99-7, properties 138010-53-4, properties 188053-55-6, properties 335357-06-7, properties 335357-07-8, properties 335357-08-9, properties 335357-09-0, properties 335357-10-3, properties 335357-11-4, properties 335357-12-5 335357-13-6

335357-14-7 335357-15-8, properties 335357-16-9, properties 335357-17-0, properties 335357-18-1, properties 335357-19-2, properties 335357-20-5, properties 335357-21-6, properties **335357-22-7**
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(**hot**-dip galvanized **steel sheet** having high strength and good formability and **plating** ability)

IT **335357-22-7**
RL: PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(**hot**-dip galvanized **steel sheet** having high strength and good formability and **plating** ability)

L74 ANSWER 3 OF 13 HCAPLUS COPYRIGHT 2002 ACS
2000:356495 Document No. 132:350988 High-strength **hot-rolled steel sheets** with good stretch-flangeability and their **manufacture**. Kashima, Takahiro; Hashimoto, Shunichi (Kobe Steel, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 2000144259 A2 20000526, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1998-315603 19981106.

AB Steels contg. C 0.02-0.10, Mn .ltoreq.2.5, Si .ltoreq.2.0, P .ltoreq.0.08, S .ltoreq.0.05, Al .ltoreq.0.10, and Ti 0.05-0.5 and/or Nb 0.05-0.5 mass% at C < [(Ti - 3.43N - 1.5S)/4 + Nb/7.75] are **heated** at .gtoreq.1100.degree., **hot-rolled** at finish temp. (Ar3 + 100).degree. - (Ar3 - 30).degree., **cooled** at an av. **cooling** rate of .gtoreq.30.degree./s, coiled at 400-600.degree., and then **cooled** at an av. **cooling** rate of <30.degree./min to give the **steel sheets** having A.I. (**aging** index) .ltoreq.15 N/mm2 and, substantially, a single-phase acicular ferrite structure. The **steel sheets** may also contain .ltoreq.0.5 mass% Mo and/or .ltoreq.0.5 mass% Cr and .ltoreq.0.0020 mass% Ca. The sheets are useful for automobile parts.

IC ICM C21D009-46
ICS C21D008-04; C22C038-00; C22C038-14; C22C038-22

CC 55-11 (Ferrous Metals and Alloys)

ST **hot rolling** steel stretch flangeability automobile

IT **Rolling** (metals)
(**hot**; **cooling** rates after **hot rolling** for high-strength **steel sheets** with good stretch-flangeability)

IT Automobiles
(parts; **cooling** rates after **hot rolling** for high-strength **steel sheets** with good stretch-flangeability)

IT 269718-96-9, processes 269718-97-0, processes 269718-98-1, processes 269718-99-2, processes **269719-00-8 269719-01-9**
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**cooling** rates after **hot rolling** for high-strength **steel sheets** with good stretch-flangeability)

IT 7440-70-2, Calcium, uses
RL: MOA (Modifier or additive use); USES (Uses)
(microalloying element; **cooling** rates after **hot rolling** for high-strength **steel sheets** with good stretch-flangeability)

IT **269719-00-8 269719-01-9**
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)

(**cooling** rates after **hot rolling** for high-strength **steel sheets** with good stretch-flangeability)

L74 ANSWER 4 OF 13 HCAPLUS COPYRIGHT 2002 ACS
2000:267373 Document No. 132:282279 **Hot**-dip galvanized **hot -rolled steel sheets** having high strength, formability, and corrosion resistance and their **manufacture**. Kawasaki, Kaoru; Hayashida, Teruki; Shindo, Hidetoshi (Nippon Steel Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2000119831 A2 20000425, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1998-286751 19981008.

AB The **hot-rolled steel sheets** have an alloy layer contg. Ni and having a **thickness** of 0.04-5 .mu.m as undercoat and a Zn alloy layer contg. 0.1-10% Al and 0.05-5% Mg and having a **thickness** of .ltoreq.100 .mu.m. The **steel sheets** have tensile strength .gtoreq.590 MPa and good formability and high corrosion resistance. The **steel sheets** contain C 0.001-0.1, Si 0.01-2, Mn 1.0-3.5, P 0.001-0.1, S 0.001-0.015, Ti 4xN% - 0.05, Nb 0.005-0.05, Mo 0.2-0.8, Al 0.01-0.1, and N .ltoreq.0.005% with C.gtoreq.-0.049(Mn+1.7Mo)+0.15. The **steel sheets** are **manufd**. by continuously casting steel to slab, finish **rolling** at .gtoreq.Ar3 transformation point, air **cooling** until the ferrite fraction increases to .gtoreq.70%, **cooling** at 5-150.degree./s, **coiling** at 350-650.degree., acid pickling, **electroplating** with Ni, **heating** to <550.degree., and dipping into molten Zn bath.

IC ICM C23C002-06
ICS C22C038-00; C22C038-14; C23C002-02; C23C028-02

CC 55-6 (Ferrous Metals and Alloys)

ST **steel sheet hot rolling** galvanizing

IT Galvanizing
(**hot**-dip; **manuf**. of **steel sheets** having high strength, formability, and corrosion resistance by **hot rolling**, nickel **electroplating**, and galvanizing)

IT **Rolling** (metals)
(**hot**; **manuf**. of **steel sheets** having high strength, formability, and corrosion resistance by **hot rolling**, nickel **electroplating**, and galvanizing)

IT Electrodeposition
Tensile strength
(**manuf**. of **steel sheets** having high strength, formability, and corrosion resistance by **hot rolling**, nickel **electroplating**, and galvanizing)

IT 67955-19-5, processes 133072-02-3, processes 134059-14-6, processes 160913-96-2, processes 173736-58-8, processes 264151-03-3, processes 264151-05-5 264151-07-7, processes 264151-09-9, processes 264151-12-4 264151-17-9, processes 264151-18-0 264151-19-1, processes 264151-20-4, processes 264151-22-6
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(**manuf**. of **steel sheets** having high strength, formability, and corrosion resistance by **hot rolling**, nickel **electroplating**, and galvanizing)

IT 7440-02-0, Nickel, uses 143497-45-4 **264151-23-7**
RL: TEM (Technical or engineered material use); USES (Uses)
(**manuf**. of **steel sheets** having high strength, formability, and corrosion resistance by **hot**

rolling, nickel **electroplating**, and galvanizing)
IT **264151-23-7**
RL: TEM (Technical or engineered material use); USES (Uses)
(**manuf**. of **steel sheets** having high strength, formability, and corrosion resistance by **hot rolling**, nickel **electroplating**, and galvanizing)

L74 ANSWER 5 OF 13 HCAPLUS COPYRIGHT 2002 ACS
1998:512626 Document No. 129:191945 **Hot rolled steel sheets** with excellent corrosion resistance and strong scale adhesion, and their **manufacture**. Imai, Norio; Nagamichi, Tsuneaki (Sumitomo Metal Industries, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 10212560 A2 19980811 Heisei, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-18025 19970131.
AB The steel **sheets** contain C .ltoreq.0.2, Si .ltoreq.0.08, Mn 0.05-2, P 0.01-0.06, S .ltoreq.0.015, Al 0.1-1, Cu 0.1-0.5, Ni 0.01-0.3, Nb 0-0.1, Ti 0-0.1, V 0-0.2, Cr 0-1, Mo 0-0.5, B 0-0.005, Ca 0-0.004, Zr 0-0.05, and rare earth metals 0-0.05% and have surface scale **thickness** .ltoreq.5 .mu.m. Steel **sheets** having the above compns. are finish rolled at initial temp. .ltoreq.1100.degree. and finishing temp. .ltoreq.900.degree., started forced **cooling** (at .gtoreq.20.degree./s to at least 700.degree.) within 2 s after finishing finish rolling, and then **coiled** at .ltoreq.550.degree. to give the title steel **sheets**. The **sheets** are useful for automobile parts, building materials, pipes, etc.
IC ICM C22C038-58
ICS B21B003-00; C21D008-02; C22C038-00
CC 55-3 (Ferrous Metals and Alloys)
ST **hot rolled steel sheet** corrosion resistance; scale adhesion **hot rolled steel sheet**
IT Metalworking
(**coiling**; **manuf**. of **hot rolled steel sheets** with excellent corrosion resistance and strong scale adhesion by controlled finish rolling and **cooling**)
IT **Cooling** .
(forced; **manuf**. of **hot rolled steel sheets** with excellent corrosion resistance and strong scale adhesion by controlled finish rolling and **cooling**)
IT Rolling (metals)
(**hot**, finish; **manuf**. of **hot rolled steel sheets** with excellent corrosion resistance and strong scale adhesion by controlled finish rolling and **cooling**)
IT Corrosion-resistant materials
Scale (deposits)
(**manuf**. of **hot rolled steel sheets** with excellent corrosion resistance and strong scale adhesion by controlled finish rolling and **cooling**)
IT 211691-71-3, processes 211691-76-8, processes 211691-81-5, processes 211691-85-9, processes 211691-87-1, processes 211691-89-3, processes 211691-91-7, processes 211691-93-9, processes 211691-95-1, processes 211691-97-3, processes 211691-99-5, processes 211692-01-2, processes 211692-03-4, processes **211692-05-6** 211692-07-8, processes 211692-09-0, processes 211692-11-4, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**manuf**. of **hot rolled steel**

sheets with excellent corrosion resistance and strong scale adhesion by controlled finish rolling and **cooling**)

IT **211692-05-6**
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**manuf.** of **hot rolled steel** **sheets** with excellent corrosion resistance and strong scale adhesion by controlled finish rolling and **cooling**)

L74 ANSWER 6 OF 13 HCAPLUS COPYRIGHT 2002 ACS
1998:86298 Document No. 128:143463 High strength formable carbon-manganese **steel sheets** for automotive applications. Jones, A.; Reynolds, J. H.; Evans, P. J.; Wade, B. A. (British Steel plc, London, SE1 7SN, UK). Commission of the European Communities, [Report] EUR, EUR 17864, 1-167 (English) 1997. CODEN: CECED9. ISSN: 1018-5593.

AB Lab. investigations have been carried out to study the effects of compn. and processing variables on the transformation behavior, microstructures and properties of carbon-manganese steels alloyed using silicon, molybdenum, chromium and phosphorus. Based on the results obtained, **prodn.** trials have been conducted on both wide and narrow **hot**-strip mills aimed at developing formable **hot**-**rolled steels** possessing **tensile** strengths within the range 500 to 800 N/mm2. In addn., an exptl. program of work has been carried out to examine the relationship between microstructure and properties in TRIP steels. Silicon and phosphorus promote the **formation** of **martensite** at relatively slow **cooling** rates following completion of **formation** of other phases. The **hardening** effects of carbon and molybdenum in these steel types lead to a decrease in the **ferrite** start temp. and move the **ferrite** region in the CCT diagram to slower **cooling** rates. Plant trials confirmed findings from transformation studies that tri-phase **ferrite**-bainite-**martensite** microstructures can be obtained using a 0.09%C-1.5%Mn-0.7%Si steel; this steel combined high strength (750 N/mm2 **tensile** strength) with good cold formability and a low ratio of yield to **tensile** strength. Structure-property studies in carbon-manganese steels contg. **ferrite**-bainite microstructures have demonstrated that strength can be increased either by microstructural refinement or by increased amt. of bainite, but that better ductility is achieved by strengthening from refinement. Transformation studies and plant trials have demonstrated that there is scope for **producing** as-**hot**-**rolled** dual-phase **steels** with relatively lean compns. (i.e. reduced silicon, chromium and molybdenum) and using phosphorus addns. to compensate for low silicon **levels**. Multistage **cooling** schedules should be adopted rather than relying on more expensive steel compns. (e.g. contg. chromium or molybdenum) combined with single-stage **cooling** to provide the requisite transformation characteristics. A further benefit of multistage **cooling** would be that variability would be minimized. Sticky scale was encountered in the dual-phase steels and attributed to the presence of high silicon **levels**; the addn. of phosphorus, copper or nickel could combat the problem. Lab. simulations of **cooling** conditions attainable on **hot**-strip run out **cooling** systems showed that **ferrite**-bainite-retained austenite microstructures can be developed using two-stage **cooling** with an intermediate air **cooling** stage at 700 .degree.C and **coiling** at about 400 .degree.C. **Prodn.** trials confirmed that TRIP steels combining high strength (750 n/mm2 av. **tensile** strength) with good elongation can be obtained using a steel contg. 0.18% carbon, 1.4% manganese and 1.5% silicon and **cooled** after

rolling according to these conditions. These TRIP steels possess good cold formability over a range of different combinations of **sheet** drawing and stretching modes and during edge **forming** operations. These steels undergo slight cyclic **hardening** during low-cycle fatigue tests. The **tensile** properties depend not only on the amt. of retained austenite originally present but also on the subsequent **strain**-induced transformation behavior. In order to optimize **tensile** properties, the max. amt. of transformation is required and this should proceed gradually during **straining** rather than rapidly during the early stages. Improvement in **tensile** elongation imparted by **strain**-induced transformation of austenite is derived from enhanced work **hardening** up to the onset of **tensile** instability.

CC 55-3 (Ferrous Metals and Alloys)

ST transformation induced plasticity steel development automobile; automobile body **steel sheet** TRIP

IT Automobiles
(bodies; high strength formable carbon-manganese **steel sheets** for automotive applications)

IT **Cooling**
(continuous; high strength formable carbon-manganese **steel sheets** for automotive applications)

IT Metalworking
(high strength formable carbon-manganese **steel sheets** for automotive applications)

IT 12173-93-2, **Martensite**, processes 12244-31-4, Austenite, processes 12427-23-5, Bainite 12427-24-6, **Ferrite** ferrous metal component **202211-32-3**, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(high strength formable carbon-manganese **steel sheets** for automotive applications)

IT 87467-40-1, processes 114146-67-7, Carbon 0.2, iron 97, manganese 1.4, silicon 1.5, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(high strength formable carbon-manganese **steel sheets** for automotive applications)

IT **202211-32-3**, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(high strength formable carbon-manganese **steel sheets** for automotive applications)

L74 ANSWER 7 OF 13 HCAPLUS COPYRIGHT 2002 ACS

1996:630508 Document No. 125:281809 **Manufacture** of textured silicon **steel sheets** by a single-stage cold **rolling** process. Harase, Jiro; Kurosawa, Fumio (Shinnippon Seitetsu Kk, Japan). Jpn. Kokai Tokkyo Koho JP 08225843 A2 19960903 Heisei, 10 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1995-49270 19950215.

AB The **sheets** are **manufd.** of **steel** contg. C 0.015-0.100, Si 2.0-4.5, Al 0.02-0.060, N 0.005-0.010, S and/or Se 0.010-0.040, Cu 0.01-1, Mn 0.01-0.5, Sn 0.001-0.3%. The steel slab is rough **rolled** at 1150-1400.degree. and finish **rolled** to give **hot-rolled** sheets having a thickness of 1.0-2.5 mm. These **hot-rolled** sheets are **heated** for 1-60 s at 950-1150.degree., **cooled** to 900.degree. at a rate lower than air **cooling** rate, then **cooled** at a rate higher than air **cooling** rate, and cold **rolled** to a

thickness of 0.10-0.30 mm. The cold-**rolled** sheets are **heated** in a decarburizing atm. for 20-200 s at 830-860.degree., **heated** for 10-180 s in a reducing atm. with a dew point of (-40)-0.degree. at a temp. within a range related to the rough **rolling** temp. and the amt. of S and/or Se, and then, after the total N is adjusted for 100-200 ppm, is coated with an annealing parting **agent** and finish annealed. Optional components in the steel are Bi 0.0050-0.15, P 0.001-0.15, Sb 0.001-0.15, Pb 0.001-0.15, and B 0.0010-0.1%. Thin **steel sheets** can be obtained in a single-stage cold **rolling** process.

IC ICM C21D008-12
ICS C22C038-00; C22C038-16; H01F001-16

CC 55-11 (Ferrous Metals and Alloys)
Section cross-reference(s): 77

ST silicon steel cold **rolling**

IT Metalworking
(**rolling**, **manuf**. of textured silicon **steel sheets** by single-stage cold **rolling** process)

IT 85368-03-2 **182277-42-5** 182277-44-7
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(**manuf**. of textured silicon **steel sheets** by single-stage cold **rolling** process)

IT **182277-42-5**
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(**manuf**. of textured silicon **steel sheets** by single-stage cold **rolling** process)

L74 ANSWER 8 OF 13 HCAPLUS COPYRIGHT 2002 ACS

1995:668410 Document No. 123:119548 **Manufacture** of ultrathin **steel sheets** for bodies of welding cans suitable for high-speed welding. Maruoka, Kuniaki; Ooga, Tomoya; Sakyama, Tatsuya; Ikeda, Masao; Kono, Takeshi (Shinnippon Seitetsu Kk, Japan). Jpn. Kokai Tokkyo Koho JP 07109525 A2 19950425 Heisei, 7 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1993-254568 19931012.

AB Steel slabs contg. C >0.0060 and <0.0600, Si .ltoreq.0.06, Mn 0.05-0.60, P .ltoreq.0.06, S .ltoreq.0.06, acid sol. Al 0.005-0.100, and N 0.0010-0.0100% is **cooled** to <Ar3, **heated** to .gtoreq.1050.degree., **hot rolled** at finish temp. of .gtoreq.Ar3, **coiled** at .ltoreq.680.degree., pickled, cold **rolled**, recrystn. annealed, and cold **rolled** at .gtoreq.2 but <10% draft to give ultrathin sheets having **thickness** .ltoreq.0.26 mm, HR30-T **hardness** .gtoreq.62, and **rolling** -direction **tensile** strength .gtoreq.44 kg/mm2. The slabs may be directly **hot rolled** at surface temp. .gtoreq.900.degree. without post-cast **cooling** to <Ar3. Optionally, the steels contain 0.005-0.100% Cr.

IC ICM C21D009-48
ICS C21D008-04; C22C038-00; C22C038-06

CC 55-11 (Ferrous Metals and Alloys)

ST welding can body **steel sheet**

IT Cans
(bodies; **manuf**. of ultrathin **steel sheets** for welding can bodies suitable for high-speed welding)

IT Welding
(high-speed; **manuf**. of ultrathin **steel sheets** for welding can bodies suitable for high-speed welding)

IT 12716-99-3, processes 12727-73-0, processes 92049-14-4, processes **166379-29-9**, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)

(**manuf**. of ultrathin **steel sheets** for welding can bodies suitable for high-speed welding)

IT **166379-29-9**, processes
RL: PEP (Physical, engineering or chemical process); PRP (Properties); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(**manuf**. of ultrathin **steel sheets** for welding can bodies suitable for high-speed welding)

L74 ANSWER 9 OF 13 HCAPLUS COPYRIGHT 2002 ACS
1995:249061 Document No. 122:86514 **Manufacture** of **steel sheets** for welded cans. Maruoka, Kuniaki; Furuno, Yoshikuni; Ooga, Tomoya (Shinnippon Seitetsu Kk, Japan). Jpn. Kokai Tokkyo Koho JP 06264138 A2 19940920 Heisei, 7 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 1993-52608 19930312.

AB The process comprises **cooling** steel slabs contg. C >0.0060 and <0.0600, Si .ltoreq.0.06, Mn 0.05-0.60, P .ltoreq.0.06, S .ltoreq.0.06, sol. Al 0.005-0.100, and N >0.0100 and .ltoreq.0.0300% below Ar3; **heating** to .gtoreq.1050.degree.; **hot rolling** the **steels**; or alternatively **hot rolling** the slabs without **cooling** after casting at the surface temp. .gtoreq.900.degree.; finishing at a **temp. higher** than Ar3; **coiling** at .ltoreq.680.degree.; acid pickling the **coils**; cold **rolling** the **coils**; **heating** to 590-750.degree.; soaking for .gtoreq.10 s; **cooling** the **sheets**; then secondary cold **rolling** with a draft .gtoreq.2% and <10% to give **steel sheets** having a **thickness** .ltoreq.0.26 mm, **hardness** HR30-T .gtoreq.62, and **tensile** strength in the **rolling** direction .gtoreq.44 kg/mm2.

IC ICM C21D008-02
ICS C21D009-46
ICA C22C038-00; C22C038-06
CC 55-11 (Ferrous Metals and Alloys)
ST **steel sheet rolling** welded can
IT Cans
(welded; annealing condition control in **manuf**. of **steel sheets** for welded cans)
IT 12716-99-3, processes 92049-14-4, processes 127277-73-0 **160402-71-1**, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(annealing condition control in **manuf**. of **steel sheets** for welded cans)
IT **160402-71-1**, processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(annealing condition control in **manuf**. of **steel sheets** for welded cans)

L74 ANSWER 10 OF 13 HCAPLUS COPYRIGHT 2002 ACS
1993:107283 Document No. 118:107283 **Manufacture** of steel strips having high hardness by strain-**aging** and baking for automobiles. Kino, Nobuyuki (Nippon Steel Corp., Japan). Jpn. Kokai Tokkyo Koho JP 04214820 A2 19920805 Heisei, 4 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 1990-410515 19901214.

AB A steel contg. C 0.002-0.2, Si 0.001-2.0, Mn 0.001-5.0, P 0.001-0.5, sol. Al 0.001-0.1, N 0.0002-0.005, and Mo and/or Cr 0.1-2.0% is cold-**rolled**, continuously annealed at 700-950.degree., **cooled** at >200.degree./s and .ltoreq.300.degree./s in 400-700.degree., and skin-pass-**rolled** by 0.2-2.0% draft to obtain a steel strip

having low elongation at yield point, increased yield strength by **heating** at baking temp., and useful for automobiles.

IC ICM C21D009-46
ICS C22C038-00; C22C038-18; C22C038-22
CC 55-11 (Ferrous Metals and Alloys)
ST automobile **steel sheet** baking hardness
IT Automobiles
(steel strips for, strain-**aging** and baking in **manuf**. of, for high strength and hardness)
IT 80455-32-9P, properties 125799-36-2P, properties **146020-97-5P**, properties 146020-98-6P 146077-32-9P, properties 146077-33-0P, properties 146077-34-1P, properties 146077-35-2P, properties
RL: PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)
(strips, strain-**aging** and baking in **manuf**. of, for high strength and hardness, for automobiles)
IT **146020-97-5P**, properties
RL: PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)
(strips, strain-**aging** and baking in **manuf**. of, for high strength and hardness, for automobiles)

L74 ANSWER 11 OF 13 HCAPLUS COPYRIGHT 2002 ACS
1993:64301 Document No. 118:64301 Cold-**rolled steel sheet** having dual-phase structure and bake-**hardening** properties. Chou, Tung Sheng (China Steel Corp. Ltd., Taiwan). U.S. US 5123969 A 19920623, 12 pp. (English). CODEN: USXXAM. APPLICATION: US 1991-648937 19910201.
AB The cold-**rolled sheet** suitable for automotive body panels is **manufd**. from continuously cast ingot slabs of microalloyed steel contg. C 0.02-0.06, Mn 0.60-1.40, Si .ltoreq.0.5, P, Ti, and Al .ltoreq.0.1 each, N .ltoreq.0.01%, and B .ltoreq.50 ppm. The **heated** slab is **hot rolled**, **coiled** at 560-720.degree., **cooled** and cold **rolled**. The **sheet** is **heated** at 780-900.degree. for <5 min to promote dual-phase microstructure with intercrit. **ferrite** and austenite, **cooled** in air to 650-750.degree., **quenched** at 50-400.degree./s to 200-400.degree., and overaged for 1-6 min for the dual-phase structure with **ferrite** and **martensite**. Thus, the microalloyed **steel** having **sheet** **tensile** strength .apprx.40 kg/mm2 contained C 0.04, Si 0.03, Mn 1.1, S and P 0.018 each, Al 0.060, and N 0.0070%. **Tensile** yield strength was 21.3 kg/mm2, and was increased by 4.8 kg/mm2 in bake **hardening**.
IC ICM C21D008-00
NCL 148547000
CC 55-11 (Ferrous Metals and Alloys)
ST **steel sheet** bake **hardening**; **ferrite** **martensite steel sheet**; automobile panel steel microalloying
IT Coating process
(**steel sheet** for, with bake **hardening** for increased panel strength)
IT **145515-58-8**, miscellaneous
RL: MSC (Miscellaneous)
(cold-**rolled sheet** with bake **hardening**)
IT 51403-43-1, miscellaneous 78799-42-5, miscellaneous 83211-47-6, miscellaneous 93802-49-4, miscellaneous 114089-23-5, miscellaneous
RL: MSC (Miscellaneous)
(microalloyed, for cold-**rolled sheet** with bake

hardening, **heat** treatment of)
IT **145515-58-8**, miscellaneous
RL: MSC (Miscellaneous)
(cold-**rolled sheet** with bake **hardening**)

L74 ANSWER 12 OF 13 HCAPLUS COPYRIGHT 2002 ACS
1988:25130 Document No. 108:25130 Effect of **cooling** conditions in continuous annealing on the properties of automobile **sheet steel**. Bodyako, M. N.; Gresskii, L. N.; Krylov-Olefirenko, V. V.; Frantsenyuk, L. I. (Fiz. Tekh. Inst., Minsk, USSR). Metallovedenie i Termicheskaya Obrabotka Metallov (7), 4-6 (Russian) 1987. CODEN: MTOMAX. ISSN: 0026-0819.
AB Strip 1.2 mm thick of cold-**rolled** steel 08Yu was annealed by elec.-resistance **heating** followed by partial **quenching** in water and final **cooling** in air. Tensile strength of the steel was insensitive to annealing, but the **heat** treatment was suitable for steel strip **hot-rolled** and coiled at a **low** finishing **temp**. **Age**-hardening tendency of the strip **product** was not prevented by the **heat** treatment.
CC 55-5 (Ferrous Metals and Alloys)
ST steel strip **heat** treatment strength
IT **12743-51-0**, 08Yu, properties
RL: PRP (Properties)
(**heat** treatment of strip, tensile properties in relation to)
IT **12743-51-0**, 08Yu, properties
RL: PRP (Properties)
(**heat** treatment of strip, tensile properties in relation to)

L74 ANSWER 13 OF 13 HCAPLUS COPYRIGHT 2002 ACS
1980:590192 Document No. 93:190192 Testing the **production** of cold-**rolled** low-alloy **steel** for cold stamping. D'yakonova, V. S.; Prishchepo, T. R.; Demidova, A. A.; Slavov, V. I. (Cherepovets. Metall. Zavod, Cherepovets, USSR). Stal' (8), 693-6 (Russian) 1980. CODEN: STALAQ. ISSN: 0038-920X.
AB In the **prepn**. of truck-body parts from low-alloy cold-**rolled steels** 09G2S [37195-20-3], 10G2S1 [37310-66-0], and 09G2 [12724-54-8] instead of 08Yu, the **thickness** of parts was decreased by 10% (from 2 to 1.8 mm). The stamping of parts from the 09G2S type steel with yield strength of 310-50 MPa presented no difficulties. In **producing** the low-alloy steel for cold stamping, the best combination of properties was obtained by using the same technolog. conditions as in **prepn**. of steel 08Yu (i.e., Al content of 0.02-0.05%, optimal **cooling** conditions of **hot** -rolled strip, 20-h annealing at 720.degree. for 20-ton **coil**, and slow **cooling** at .apprx.10.degree./h to 140.degree.).
CC 55-11 (Ferrous Metals and Alloys)
ST steel **sheet** stamping property; truck body steel **sheet** stamping
IT 12724-54-8, uses and miscellaneous **12743-51-0**, uses and miscellaneous 37195-20-3, uses and miscellaneous 37310-66-0, uses and miscellaneous
RL: USES (Uses)
(stamping of cold-rolled, for truck-body parts)
IT **12743-51-0**, uses and miscellaneous
RL: USES (Uses)
(stamping of cold-rolled, for truck-body parts)

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L76 ANSWER 1 OF 3 HCAPLUS COPYRIGHT 2002 ACS
1999:156934 Document No. 130:240393 **Steel sheets** with fluting resistance and their **manufacture**. Takahashi, Yuzo; Wakita, Junichi (Nippon Steel Corp., Japan). Jpn. Kokai Tokkyo Koho JP 11061329 A2 19990305 Heisei, 10 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1997-241731 19970825.

AB The sheets are characterized by that the thickness of the front surface layer and the thickness of the back surface layer are more than 0.03 .times. t (t; total thickness) and the **hardness** of the front surface layer is equal to that of the back surface layer and the value is .gtoreq.140 and av. **hardness** in the thickness direction is <140. The regulation of the thickness ratio of the above both surface layers and regulation of the difference of **hardness** between the core and the surface layers contribute to improvement of fluting resistance. The **sheets** are **manufd.** from **steel** strips, comprising the both surface layers contg. C .ltoreq.0.15, Si .ltoreq.1.5, Mn .gtoreq.0.2, P .ltoreq.0.2, S .ltoreq.0.1, Al 0.001-0.1, and N .ltoreq.0.01 wt.% and the cores contg. C .ltoreq.0.15, Si .ltoreq.1.5, Mn .ltoreq.1.5, P .ltoreq.0.2, S .ltoreq.0.1, Al 0.001-0.1, and N .ltoreq.0.01 wt.%, by **hot rolling** under temp. specified in the claim, **cooling** at rates specified in the claim, and **winding** at .ltoreq.550.degree.. The contents of Mn in the both surface layers are .gtoreq.0.2 wt.% higher than those in the cores and the thickness of the layers are regulated as described in the strips.

IC ICM C22C038-00
ICS C21D008-02; C22C038-06

CC 55-3 (Ferrous Metals and Alloys)

ST **steel sheet** fluting resistance; surface layer core **hardness** regulation sheet; thickness ratio surface layer core sheet; **hard** surface layer sheet fluting resistance; manganese content regulation **steel sheet**

IT **Rolling** (metals)
(**hot**, temp.-regulated; in **manuf.** of **steel sheets** having **hard** surface layers and regulated thickness ratio with fluting resistance)

IT **Cooling**
(rate-regulated; in **manuf.** of **steel sheets** having **hard** surface layers and regulated thickness ratio with fluting resistance)

IT 11102-29-7, uses 12700-72-0, uses 12724-44-6, uses 12727-73-0, uses 12753-99-0, uses 12790-81-7, uses 37186-65-5, uses 56364-92-2, uses 130438-56-1, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(core layer; **steel sheets** having **hard** surface layers and regulated thickness ratio with fluting resistance)

IT **221253-88-9**
RL: TEM (Technical or engineered material use); USES (Uses)
(core; **steel sheets** having **hard** surface layers and regulated thickness ratio with fluting resistance)

IT 12730-37-9, uses 12753-98-9, uses 37219-37-7, uses 73035-46-8, uses 75044-03-0, uses 78799-42-5, uses 93802-49-4, uses 113413-50-6, uses 139380-60-2, uses **221253-90-3**
RL: TEM (Technical or engineered material use); USES (Uses)
(**hard** surface layer; **steel sheets** having **hard** surface layers and regulated thickness ratio with fluting resistance)

IT **221253-88-9**
RL: TEM (Technical or engineered material use); USES (Uses)
(core; **steel sheets** having **hard** surface

layers and regulated thickness ratio with fluting resistance)

IT **221253-90-3**
RL: TEM (Technical or engineered material use); USES (Uses)
(**hard** surface layer; **steel sheets** having **hard** surface layers and regulated thickness ratio with fluting resistance)

L76 ANSWER 2 OF 3 HCAPLUS COPYRIGHT 2002 ACS
1995:541736 Document No. 123:38268 High-strength **steel sheets** with bake **hardenability** for can **manufacture**. Tosaka, Akio; Kukuminato, Hideo; Kato, Toshuki (Kawasaki Steel Co, Japan). Jpn. Kokai Tokkyo Koho JP 07062486 A2 19950307 Heisei, 8 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1993-211514 19930826.

AB The microalloyed steel for tinplate in can **manuf**. contains C 0.08-0.15, Si .ltoreq.0.10, Mn 0.05-1.60, Al 0.020-0.150, P 0.015-0.150, S .ltoreq.0.010, N 0.0050-0.0120, and optionally Ni 0.050-0.50, Cu 0.050-0.50, and/or B 0.0005-0.0030%. The **steel sheets** have ferritic microstructure with dispersed pearlite for increased strength. The **sheets** are **manufd**. by **hot rolling** of the **steel** ingot slab with finishing at 850-930.degree., immediate **cooling** at .gtoreq.50.degree./s, and **coiling** at 400-540.degree., followed by acid pickling, primary cold **rolling** at 70-90% draft, adjusting the austenite content to 10-50% by controlled **heating** at .ltoreq.850.degree. for .gtoreq.20 s, **cooling** to .ltoreq.400.degree. at .gtoreq.70.degree./s, reheating at .gtoreq.300.degree. for 20-60 s, **cooling**, and secondary cold **rolling** at 10-35% draft.

IC ICM C22C038-00
ICS C21D008-02; C22C038-06; C22C038-16

CC 55-11 (Ferrous Metals and Alloys)

ST **steel** microalloyed **sheet** can **manuf**

IT Cans
(**steel sheets** with bake **hardenability** for can **manuf**.)

IT 12716-40-4, uses 12716-55-1, uses 12754-98-2, uses 75902-38-4, uses 108184-26-5, uses 163767-26-8, uses 163767-27-9, uses 163767-28-0, uses **164205-07-6**, uses 164251-58-5, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(microalloyed; **steel sheets** with bake **hardenability** for can **manuf**.)

IT **164205-07-6**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(microalloyed; **steel sheets** with bake **hardenability** for can **manuf**.)

L76 ANSWER 3 OF 3 HCAPLUS COPYRIGHT 2002 ACS
1986:228298 Document No. 104:228298 Improving the quality of semifinished **rolled** stock for high-speed **heat** treatment. Frantsenyuk, L. N.; Frantsenyuk, L. I.; Frantsenyuk, I. V.; Astapchik, S. A.; Gresskii, L. N.; Frantsenyuk, L. I.; Pimenov, A. F. (Novolipetsk. Metall.-Komb., Novolipetsk, USSR). Stal' (2), 75-9 (Russian) 1986. CODEN: STALAQ. ISSN: 0038-920X.

AB The effect of **hot rolling** parameters on the structure and properties of continuously **heat**-treated automobile **sheet steel** 08Yu [**12743-51-0**] was studied. A uniform coarse-grain structure of the semiproduct was attained by limiting C and N contents in the steel at .ltoreq.0.04 and <0.005%, resp., and by controlling the temp. of finish **rolling** and **coiling** at 800-900 and >700.degree., resp. Sepn. of the residual phase pptn. and recrystn. processes occurred in the control-**rolled** and spray-

cooled strips, resulting in **formation** of stable (along the **coil** length) mech. properties ranging at **tensile** strength 300-360, yield strength 190-200 N/mm2, elongation 38-40%, Rockwell B **hardness** 38-46.
CC 55-5 (Ferrous Metals and Alloys)
ST automobile **sheet steel hot rolling** ; quality **steel hot rolling** control; continuous **heat** treatment **sheet rolling**; structure mech property automobile **sheet**
IT Automobiles
(continuous **heat**-treated **sheets** for, controlled **rolling** of, structure and mech. properties in relation to)
IT 12597-69-2, uses and miscellaneous **12743-51-0**, uses and miscellaneous
RL: USES (Uses)
(controlled **rolling** of automobile **sheets** from, for continuous **heat** treatment, structure and mech. properties in relation to)
IT **12743-51-0**, uses and miscellaneous
RL: USES (Uses)
(controlled **rolling** of automobile **sheets** from, for continuous **heat** treatment, structure and mech. properties in relation to)

*** Andrew, Metadex doesn't support highlighting of terms.

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L89 ANSWER 1 OF 9 METADEX COPYRIGHT 2002 CSA
AN 2000(6):31-2765 METADEX
TI Effects of microstructures on the stretch-flangeability and tensile properties of hot-rolled high strength steel sheets.
AU Cho, Y.-R. (Pohang Iron and Steel); Chung, J.-H. (Pohang Iron and Steel); Seol, K.-S. (Pohang Iron and Steel); Kim, I.-B. (Pusan National University)
SO Journal of the Korean Institute of Metals and Materials (1999) 37, (12), 1494-1501, Graphs, Photomicrographs, 17 ref.
ISSN: 0253-3847
DT Journal
CY Korea, Republic of
LA Korean
AB The effects of the microstructures on the stretch-flangeability and tensile properties of Nb or Ti-N added hot-rolled high strength steel with tensile strength of 60 and 70 kg/mm 2 grades were investigated to improve the stretch-flangeability, through the laboratory simulation and the mill-scale production. The low temperature coiling method developed using 3-step controlled cooling pattern after the finish rolling was suitable for the production of high strength steel with the polygonal ferrite and bainite phases. The enhanced stretch-flangeability of the ferrite-bainite dual phase steel was due to the fine grain boundary cementites and the

decrease of deviation in hardness between the ferrite and the bainite phases, and so that void formation was suppressed relative to the other type of multi-phase steels, ferrite-bainite or ferrite-bainite-martensite steels.
CC 31 Mechanical Properties; 52 Working (Forming)
CT Journal Article; High strength steels: Mechanical properties; Dual phase steels: Mechanical properties; Stretchability: Processing effects; Flanging: Processing effects; Tensile strength: Processing effects; Yield strength: Processing effects; Elongation: Processing effects; Solid phases: Processing effects; Precipitates: Processing effects; Alloying additive; Coiling; Cooling
ET Nb; N*Ti; Ti-N

L89 ANSWER 2 OF 9 METADEX COPYRIGHT 2002 CSA
AN 2000(5):31-2482 METADEX
TI Effect of controlled cooling on the formability of TS 590 MPa grade hot-rolled high strength steels.
AU Cho, Y.-R. (Pohang Iron and Steel); Chung, J.-H. (Pohang Iron and Steel); Ku, H.-H. (Pohang Iron and Steel); Kim, I.-B. (Pusan National University)
SO Metals and Materials (1999) 5, (6), 571-578, Graphs, Photomicrographs, 22 ref.
ISSN: 1225-9438
DT Journal
CY Korea, Republic of
LA English
AB The effect of cooling on the mechanical properties of hot-rolled high strength steels was investigated in order to improve the stretch-flangeability of conventional TS 590 MPa grade for the automotive parts through laboratory simulation and mill-scale production. The low temperature coiling method using a 3-step controlled cooling pattern after hot rolling was very effective for producing Nb-bearing high strength steel with high stretch-flangeability. It was suggested that the suppressed precipitation of grain boundary cementites and the decreased hardness difference between the ferrite matrix and bainite phases cause the excellent stretch-flangeability of ferrite-bainite duplex microstructure steel. Therefore, the formation and propagation of microcracks were suppressed relative to conventional HSLA steel with the ferrite and pearlite microstructure. In addition, the elongation improved compared with that of hot-rolled steel sheets using the conventional early cooling pattern because the volume fraction of polygonal ferrite increased.
CC 31 Mechanical Properties; 52 Working (Forming)
CT Journal Article; High strength steels: Mechanical properties; Formability: Cooling effects; Flanging: Cooling effects; Stretching: Cooling effects; Tensile strength: Cooling effects; Yield strength: Cooling effects; Elongation: Cooling effects; Solid phases: Cooling effects; Coiling
ET Nb

L89 ANSWER 3 OF 9 METADEX COPYRIGHT 2002 CSA
AN 1997(10):52-1837 METADEX
TI New hot rolling practice improving ductility performances of HSLA steel sheets.
AU Harlet, Ph. (Cockerill-Sambre); Feron, S. (Cockerill-Sambre); Cantinieaux, P. (Cockerill-Sambre); Huge, J. (Cockerill-Sambre); Donnay, B. (Cockerill-Sambre); Herman, J.C. (Cockerill-Sambre)
SO Iron and Steel Society/AIME. 410 Commonwealth Dr., P.O. Box 411, Warrendale, PA 15086-7512, USA. 1997. 339-350, Photomicrographs, Graphs, 15 ref.
Conference: 38th Mechanical Working and Steel Processing Conference Proceedings. Vol. XXXIV, Cleveland, Ohio, USA, 13-16 Oct. 1996

ISBN: 1-886362-15-7
DT Conference Article
CY United States
LA English
AB It is well known that using microalloyed elements leads to a reduction in the ratio between ductility and tensile strength. Earlier work has shown that the reduction is obtained firstly by a more heterogeneous grain size and secondly by the formation of coherent precipitation of the microalloyed elements in the ferrite matrix. Simulation laboratory trials have made it possible to quantify the different manufacturing parameters, such as reheating temperature roughing and finishing procedures combined with the cooling rate and coiling temperature. Optimizing these parameters and the steel composition has led to the industrial development of high strength steels that show an improvement in the properties in terms of homogeneity, reliability and enhancement of drawing formability.
CC 52 Working (Forming)
CT Conference Paper; High strength low alloy steels: Rolling; Hot rolling; Ductility; Tensile strength; Grain size; Simulation; Precipitation hardening
ALI SPXE340 CCA: SALHS; SPXE380 CCA: SALHS

L89 ANSWER 4 OF 9 METADEX COPYRIGHT 2002 CSA
AN 1994(5):45-422 METADEX
TI Development of Hot Rolled High Strength Steel With an Excellent Hole-Expansion Capability.
AU Nomura, S. (Sumitomo Metal Industries); Fukuyama, H. (Sumitomo Metal Industries); Katsu, S. (Sumitomo Metal Industries); Nakai, S. (Sumitomo Metal Industries); Komatsubara, N. (Sumitomo Metal Industries)
SO Sumitomo Metals (Sept. 1993) 45, (5), 33-40, Graphs, Photomicrographs, 9 ref.
ISSN: 0371-411X
DT Journal
CY Japan
LA Japanese
AB We have developed a new type of high-strength hot rolled sheet steel with an excellent hole-expansion capability, whose tensile strength is between 440-780 n/mm 2. Typical metallurgical characteristics of the steel are as follows: (1) decreased carbon content to reduce the amount of carbide particles and the hard second phase, and to restrict the formation of the band structure; (2) increased silicon content to enhance the formation of ductile polygonal ferrite and to reduce the difference in hardness between the ferrite matrix and the second phase; (3) higher finishing temperature to restrict the formation of the band structure; and (4) lower coiling temperature to reduce the segregation of phosphorus at grain boundaries. The developed steel shows an excellent hole-expansion capability, compared with conventional steel. In addition, this steel has good elongation because of the ductile polygonal ferrite, and also has good anti-fatigue properties because Si atoms promote solid solution hardening of the ferrite matrix.
CC 45 Ferrous Alloy Production
CT Journal Article; Alloy steels: Alloy development; Silicon: Alloying elements; Strip steel; Hot rolling; Tensile strength; Elongation
ET Si

L89 ANSWER 5 OF 9 METADEX COPYRIGHT 2002 CSA
AN 1987(9):52-1667 METADEX
TI Production of 50, 55 kgf/mm 2 Class Hot Rolled C-Mn Steel Sheets by Controlled Cooling.
AU Hosoda, T.; Mimura, K.; Hashimoto, S.-i.
SO Kobe Res. Dev. (July 1986) 36, (3), 43-46

ISSN: 0373-8868
DT Journal
LA Japanese
AB For the purpose of developing C-Mn steel sheets for automotive use, optimum cooling patterns on the runout table and the following coiling conditions were investigated. Rapid cooling to the ferrite transformation nose, short holding at that temperature and subsequent rapid cooling to the coiling temperature increase both elongation and strength of the products through the formation of ductile ferrite and a hard second phase in the microstructure. The tensile strength exceeding 50 kgf/mm 2 and high stretch flangeability are achieved by coiling 0.15C-1.2Mn steel sheet below 500 deg C. The steel shows good weldability comparable with that of conventional Nb-bearing steel. 3 ref.-AA
CC 52 WORKING (FORMING)
CT Carbon manganese steels: Rolling; Cooling; Controlled rolling; Mechanical properties: Cooling effects; Coiling
ALI CM50, CM55 CCA: SCMN
ET C*Mn; C-Mn; C-1.2Mn; Nb

L89 ANSWER 6 OF 9 METADEX COPYRIGHT 2002 CSA
AN 1986(12):45-1236 METADEX
TI Effect of Controlled Cooling on the Mechanical Properties of As-Hot-Rolled Multi-Phase Steel Sheets.
AU Sudo, M.; Iwai, T.; Hashimoto, S.; Hosoda, T.; Hirata, K.
SO The Metallurgical Society/AIME. 420 Commonwealth Dr., Warrendale, Pennsylvania 15086, USA. 1986. 501-519. Accession Number: 86(12):72-499 Conference: Accelerated Cooling of Steel, Pittsburgh, Pennsylvania, USA, 19-21 Aug. 1985
DT Conference
LA English
AB The effects of cooling conditions after hot rolling chemical compositions on the microstructures and mechanical properties have been discussed. One of the most important points in determining manufacturing multi-phase low alloy steels is to obtain desired martensite and bainite contents and to purify ferrite grains through controlled-cooling and additions of Si and Cr. The first cooling rate of controlled-cooling influences the volume of ferrite transformation, ferrite purification and enrichment of carbon to retained austenite. The second cooling rate and coiling temperature change the nature of low temperature transformation products and the solute carbon content in ferrite. Silicon accelerates transformation and purification of ferrite and then improves the tensile strength time elongation values. Chromium increases hardenability and improves yield ratio. Mill trials of recommended C-Mn-Si-Cr composition were undertaken to confirm the compositional and processing variables evaluated in the laboratory. The application of these steel sheets, tri-phase steels, for wheel disks was also conducted. 9 ref.-AA
CC 45 FERROUS ALLOY PRODUCTION
CT Low alloy steels: Alloy development; Strip steel: Alloy development; Phase transformations: Cooling effects; Mechanical properties: Cooling effects; Microstructure: Cooling effects; Automotive wheels: Materials selection
ALI Fe-0.05C-1.50Mn-0.49Cr-0.036Al-0.02Si, Fe-0.04C-1.50Mn-0.51Si-0.032Al-0.01Cr, Fe-0.05C-1.56Mn-0.49Si-0.48Cr-0.032Al CCA: SAL; Fe-0.05-C1.52Mn-1.03Cr-0.52Si-0.031Al, Fe-0.06C-1.55Mn-1.43Cr-0.50Si-0.029Al, Fe-0.04C-1.52Mn-0.97Si-0.035Al-0.02Cr CCA: SAL; Fe-0.05C-1.55Mn-0.97Si-0.51Cr-0.037Al, Fe-0.05C-1.55Mn-1.02Cr-1.01Si-0.040Al, Fe-0.08C-0.97Mn-0.94Si-0.46Cr-0.034Al CCA: SAL; Fe-0.08C-0.92Si-0.75Mn-0.46Cr-0.030Al, Fe-0.08C-1.21Mn-0.94Si-0.69Cr-0.033Al, Fe-0.08C-1.33Mn-0.41Si-0.035Al-0.03Nb CCA: SAL
ET As; Si; Cr; C*Cr*Mn*Si; C sy 4; sy 4; Cr sy 4; Mn sy 4; Si sy 4; C-Mn-Si-Cr; C*Al*Cr*Fe*Mn*Si; C sy 6; sy 6; Al sy 6; Cr sy 6; Fe sy 6; Mn

sy 6; Si sy 6; Fe-0.05C-1.50Mn-0.49Cr-0.036Al-0.02Si; Fe-0.04C-1.50Mn-0.51Si-0.032Al-0.01Cr; Fe-0.05C-1.56Mn-0.49Si-0.48Cr-0.032Al; Fe; C*Al*Cr*Mn*Si; C sy 5; sy 5; Al sy 5; Cr sy 5; Mn sy 5; Si sy 5; C1.52Mn; C cp; cp; Mn cp; C1.52Mn-1.03Cr-0.52Si-0.031Al; Fe-0.06C-1.55Mn-1.43Cr-0.50Si-0.029Al; Fe-0.04C-1.52Mn-0.97Si-0.035Al-0.02Cr; Fe-0.05C-1.55Mn-0.97Si-0.51Cr-0.037Al; Fe-0.05C-1.55Mn-1.02Cr-1.01Si-0.040Al; Fe-0.08C-0.97Mn-0.94Si-0.46Cr-0.034Al; Fe-0.08C-0.92Si-0.75Mn-0.46Cr-0.030Al; Fe-0.08C-1.21Mn-0.94Si-0.69Cr-0.033Al; C*Al*Fe*Mn*Nb*Si; Nb sy 6; Fe-0.08C-1.33Mn-0.41Si-0.035Al-0.03Nb

L89 ANSWER 7 OF 9 METADEX COPYRIGHT 2002 CSA
AN 1986(5):45-420 METADEX
TI Phosphorus-Added, Hot-Rolled, High-Strength Sheet Steel With Low Yield-to-Tensile Strength Ratio.
AU Irie, T.; Kato, T.; Tosaka, A.; Shinozaki, M.; Hashiguchi, K.
NR SAE Tech. Paper No. 850118
SO Society of Automotive Engineers, Inc.. 400 Commonwealth Dr., Warrendale, Pennsylvania 15096, USA. 1985. Pp 10. Accession Number: 86(5):72-168 Conference: International Conference & Exposition, Detroit, Michigan, USA, 25 Feb.-1 Mar. 1985
DT Conference; Report
LA English
AB A new hot rolled high strength sheet steel has been developed by utilizing controlled cooling technique after hot rolling a 0.05C-1.5Mn-0.08P steel. Phosphorus enhances ferrite transformation at higher temp., which results in a fine dispersion of austenite phase during the cooling step after hot rolling. At lower temp., P retards austenite decomposition and enhances martensite transformation when the strip is coiled at 250 deg C or below. This new high strength steel exhibits low yield-to-tensile strength ratio of 60-70%, while in conventional high strength steels, for example, a 0.15C-1.50Mn steel hot rolled and coiled at 400 deg C or below after rapid cooling, the yield ratio is approx 75%. It exhibits higher ductility, good stretch-flangeability, good fatigue property, good weldability and extremely high bake-hardenability compared to the C-Mn steel. Embrittleness due to segregation of P to grain boundaries was not observed in sheets and welded joints. This high strength steel has also good paintability and is now under commercial production for wheel discs or chassis components. 5 ref.-AA
CC 45 FERROUS ALLOY PRODUCTION
CT Automotive wheels: Materials selection; Rephosphorized steels: Alloy development; Hot rolling; Tensile properties; Drawability; Stretch forming; Fatigue life; Weldability
ALI RHA55L CCA: SCL
ET C*Mn*P; C-1.5Mn-0.08P; P; C*Mn; C-1.50Mn; C-Mn

L89 ANSWER 8 OF 9 METADEX COPYRIGHT 2002 CSA
AN 1985(12):52-2209 METADEX
TI Automotive High Strength Steel Sheets.
SO World Steel (Jpn.) (1985) (6), 34-41
DT Journal
LA Japanese
AB Several types of high strength steels have been developed with a min. loss in press-formability and with good bake hardenability (BH). Steel sheets of 50-60 kgf/mm 2 class in tensile strength are now mass-produced for automotive application. The metallurgical principle, manufacturing process and characteristics are briefly described for three cold-rolled steels: dual-phase, BH-type rephosphorized, and deep drawn high strength steel. Dual-phase is a dispersion of martensite in a ferrite matrix and is produced by continuous annealing and rapid cooling. The other two are low carbon solid solution strengthened steels. A new process has been

developed to produce hot-rolled dual-phase. Steel containing > 1% Mn or Mn + Si or P is hot-rolled, rapid-cooled, and coiled at < 400 deg C. Increased future application is anticipated because of its advantage in weight reduction.-F.S.
CC 52 WORKING (FORMING)
CT Dual phase steels: Metal working; Rephosphorized steels: Metal working; Sheet metal: Metal working; Automotive bodies: Metal working; Press forming; Deep drawing; Hardenability; Tensile properties
ET B*H; BH; B cp; cp; H cp; Mn; Si; P

L89 ANSWER 9 OF 9 METADEX COPYRIGHT 2002 CSA
AN 1982(9):61-667 METADEX
TI Development of Hot-Rolled Dual Phase Steel Sheets with Excellent Ductility.
AU Kunishige, K.; Takahashi, M.; Sugisawa, S.; Hammatsu, S.
SO Sumitomo Met. (Oct. 1981) 33, (4), 497-510
DT Journal
LA Japanese
AB As-rolled dual phase (DP) steel sheets containing small amounts of alloying elements, characterized by the accelerated cooling method have been studied in a laboratory. Trial manufactures were carried out, using the results obtained. It was revealed that DP steel sheets of 50 kgf/mm 2 to 80 kgf/mm 2 level in tensile strength with excellent ductility are obtained when plain carbon steels are finish-rolled just above the Ar3 point, accelerated-cooled and then coiled just below the M s point. The rolling and cooling conditions are related to refining the DP structure and also related to the decrease of solute carbon atoms in the ferrite matrix, resulting in the desired properties. It was also confirmed that this type of DP steel sheet shows high bake-hardening properties due to a considerable amount of solute nitrogen atom. 18 ref.-AA.
CC 61 ENGINEERING COMPONENTS AND STRUCTURES
CT Automotive bodies; Strip steel: Alloy development; Dual phase steels: Alloy development; Tensile strength; Ductility
ALI Fe-0.05C-0.32Mn CCA: SCL; Fe-0.12C-1.4Mn-0.11V CCA: SALHS; Fe-0.08C-1.53Mn-0.035Al,Fe-0.07C-0.52Si-1.58Mn-0.052Al-0.0068N CCA: SAM; Fe-0.08C-0.44Si-1.53Mn-0.039Al,Fe-0.08C-0.49Si-1.83Mn-0.049Al-0.0070N CCA: SAM; Fe-0.08C-1.53Mn-0.035Al-Si,Fe-0.08C-0.5Si-1.85Mn-0.04Al CCA: SAM; Fe-0.08C-0.52Si-1.88Mn-0.052Al-0.0075N CCA: SAM; Fe-0.08C-0.44Si-1.53Mn-0.039Al-0.0072N CCA: SAM; Fe-0.08C-0.44Si-1.53Mn-0.04Al-0.0072N CCA: SAM; Fe-0.05C-1.53Si-1.62Mn-0.51Cr-0.25Mo-0.07Al-0.0053N CCA: SALHS; Fe-0.10C-0.44Si-1.32Mn-0.05Al-0.008N CCA: SAM
ET Ar3; C*Fe*Mn; C sy 3; sy 3; Fe sy 3; Mn sy 3; Fe-0.05C-0.32Mn; C*Fe*Mn*V; C sy 4; sy 4; Fe sy 4; Mn sy 4; V sy 4; Fe-0.12C-1.4Mn-0.11V; C*Al*Fe*Mn; Al sy 4; Fe-0.08C-1.53Mn-0.035Al; C*Al*Fe*Mn*N*Si; C sy 6; sy 6; Al sy 6; Fe sy 6; Mn sy 6; N sy 6; Si sy 6; Fe-0.07C-0.52Si-1.58Mn-0.052Al-0.0068N; C*Al*Fe*Mn*Si; C sy 5; sy 5; Al sy 5; Fe sy 5; Mn sy 5; Si sy 5; Fe-0.08C-0.44Si-1.53Mn-0.039Al; Fe-0.08C-0.49Si-1.83Mn-0.049Al-0.0070N; Fe-0.08C-1.53Mn-0.035Al-Si; Fe-0.08C-0.5Si-1.85Mn-0.04Al; Fe-0.08C-0.52Si-1.88Mn-0.052Al-0.0075N; Fe-0.08C-0.44Si-1.53Mn-0.039Al-0.0072N; Fe-0.08C-0.44Si-1.53Mn-0.04Al-0.0072N; C*Al*Cr*Fe*Mn*Mo*N*Si; C sy 8; sy 8; Al sy 8; Cr sy 8; Fe sy 8; Mn sy 8; Mo sy 8; N sy 8; Si sy 8; Fe-0.05C-1.53Si-1.62Mn-0.51Cr-0.25Mo-0.07Al-0.0053N; Fe-0.10C-0.44Si-1.32Mn-0.05Al-0.008N

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L94 ANSWER 1 OF 11 METADEX COPYRIGHT 2002 CSA
AN 2000(6):31-2765 METADEX

TI Effects of microstructures on the stretch-flangeability and tensile properties of hot-rolled high strength steel sheets.
AU Cho, Y.-R. (Pohang Iron and Steel); Chung, J.-H. (Pohang Iron and Steel); Seol, K.-S. (Pohang Iron and Steel); Kim, I.-B. (Pusan National University)
SO Journal of the Korean Institute of Metals and Materials (1999) 37, (12), 1494-1501, Graphs, Photomicrographs, 17 ref.
ISSN: 0253-3847
DT Journal
CY Korea, Republic of
LA Korean
AB The effects of the microstructures on the stretch-flangeability and tensile properties of Nb or Ti-N added hot-rolled high strength steel with tensile strength of 60 and 70 kg/mm 2 grades were investigated to improve the stretch-flangeability, through the laboratory simulation and the mill-scale production. The low temperature coiling method developed using 3-step controlled cooling pattern after the finish rolling was suitable for the production of high strength steel with the polygonal ferrite and bainite phases. The enhanced stretch-flangeability of the ferrite-bainite dual phase steel was due to the fine grain boundary cementites and the decrease of deviation in hardness between the ferrite and the bainite phases, and so that void formation was suppressed relative to the other type of multi-phase steels, ferrite-bainite or ferrite-bainite-martensite steels.
CC 31 Mechanical Properties; 52 Working (Forming)
CT Journal Article; High strength steels: Mechanical properties; Dual phase steels: Mechanical properties; Stretchability: Processing effects; Flanging: Processing effects; Tensile strength: Processing effects; Yield strength: Processing effects; Elongation: Processing effects; Solid phases: Processing effects; Precipitates: Processing effects; Alloying additive; Coiling; Cooling
ET Nb; N*Ti; Ti-N

L94 ANSWER 2 OF 11 METADEX COPYRIGHT 2002 CSA
AN 2000(5):31-2482 METADEX
TI Effect of controlled cooling on the formability of TS 590 MPa grade hot-rolled high strength steels.
AU Cho, Y.-R. (Pohang Iron and Steel); Chung, J.-H. (Pohang Iron and Steel); Ku, H.-H. (Pohang Iron and Steel); Kim, I.-B. (Pusan National University)
SO Metals and Materials (1999) 5, (6), 571-578, Graphs, Photomicrographs, 22 ref.
ISSN: 1225-9438
DT Journal
CY Korea, Republic of
LA English
AB The effect of cooling on the mechanical properties of hot-rolled high strength steels was investigated in order to improve the stretch-flangeability of conventional TS 590 MPa grade for the automotive parts through laboratory simulation and mill-scale production. The low temperature coiling method using a 3-step controlled cooling pattern after hot rolling was very effective for producing Nb-bearing high strength steel with high stretch-flangeability. It was suggested that the suppressed precipitation of grain boundary cementites and the decreased hardness difference between the ferrite matrix and bainite phases cause the excellent stretch-flangeability of ferrite-bainite duplex microstructure steel. Therefore, the formation and propagation of microcracks were suppressed relative to conventional HSLA steel with the ferrite and pearlite microstructure. In addition, the elongation improved compared with that of hot-rolled steel sheets using the conventional early cooling pattern because the volume fraction of polygonal ferrite

increased.
CC 31 Mechanical Properties; 52 Working (Forming)
CT Journal Article; High strength steels: Mechanical properties; Formability: Cooling effects; Flanging: Cooling effects; Stretching: Cooling effects; Tensile strength: Cooling effects; Yield strength: Cooling effects; Elongation: Cooling effects; Solid phases: Cooling effects; Coiling
ET Nb

L94 ANSWER 3 OF 11 METADEX COPYRIGHT 2002 CSA
AN 1997(10):52-1837 METADEX
TI New hot rolling practice improving ductility performances of HSLA steel sheets.
AU Harlet, Ph. (Cockerill-Sambre); Feron, S. (Cockerill-Sambre); Cantinieaux, P. (Cockerill-Sambre); Huge, J. (Cockerill-Sambre); Donnay, B. (Cockerill-Sambre); Herman, J.C. (Cockerill-Sambre)
SO Iron and Steel Society/AIME. 410 Commonwealth Dr., P.O. Box 411, Warrendale, PA 15086-7512, USA. 1997. 339-350, Photomicrographs, Graphs, 15 ref.
Conference: 38th Mechanical Working and Steel Processing Conference Proceedings. Vol. XXXIV, Cleveland, Ohio, USA, 13-16 Oct. 1996
ISBN: 1-886362-15-7
DT Conference Article
CY United States
LA English
AB It is well known that using microalloyed elements leads to a reduction in the ratio between ductility and tensile strength. Earlier work has shown that the reduction is obtained firstly by a more heterogeneous grain size and secondly by the formation of coherent precipitation of the microalloyed elements in the ferrite matrix. Simulation laboratory trials have made it possible to quantify the different manufacturing parameters, such as reheating temperature roughing and finishing procedures combined with the cooling rate and coiling temperature. Optimizing these parameters and the steel composition has led to the industrial development of high strength steels that show an improvement in the properties in terms of homogeneity, reliability and enhancement of drawing formability.
CC 52 Working (Forming)
CT Conference Paper; High strength low alloy steels: Rolling; Hot rolling; Ductility; Tensile strength; Grain size; Simulation; Precipitation hardening
ALI SPXE340 CCA: SALHS; SPXE380 CCA: SALHS

L94 ANSWER 4 OF 11 METADEX COPYRIGHT 2002 CSA
AN 1994(5):45-422 METADEX
TI Development of Hot Rolled High Strength Steel With an Excellent Hole-Expansion Capability.
AU Nomura, S. (Sumitomo Metal Industries); Fukuyama, H. (Sumitomo Metal Industries); Katsu, S. (Sumitomo Metal Industries); Nakai, S. (Sumitomo Metal Industries); Komatsubara, N. (Sumitomo Metal Industries)
SO Sumitomo Metals (Sept. 1993) 45, (5), 33-40, Graphs, Photomicrographs, 9 ref.
ISSN: 0371-411X
DT Journal
CY Japan
LA Japanese
AB We have developed a new type of high-strength hot rolled sheet steel with an excellent hole-expansion capability, whose tensile strength is between 440-780 n/mm 2. Typical metallurgical characteristics of the steel are as follows: (1) decreased carbon content to reduce the amount of carbide particles and the hard second phase, and to restrict the formation of the band structure; (2) increased silicon content to enhance the formation of

ductile polygonal ferrite and to reduce the difference in hardness between the ferrite matrix and the second phase; (3) higher finishing temperature to restrict the formation of the band structure; and (4) lower coiling temperature to reduce the segregation of phosphorus at grain boundaries. The developed steel shows an excellent hole-expansion capability, compared with conventional steel. In addition, this steel has good elongation because of the ductile polygonal ferrite, and also has good anti-fatigue properties because Si atoms promote solid solution hardening of the ferrite matrix.
CC 45 Ferrous Alloy Production
CT Journal Article; Alloy steels: Alloy development; Silicon: Alloying elements; Strip steel; Hot rolling; Tensile strength; Elongation
ET Si

L94 ANSWER 5 OF 11 METADEX COPYRIGHT 2002 CSA
AN 1993(8):61-1049 METADEX
TI Process for Producing Automobile Body Reinforcing Steel Pipe.
AU Tanabe, H. (Nippon Steel); Yamazaki, K. (Nippon Steel)
PI US 5192376 9 Mar. 1993
AD 21 May 1992
DT Patent
LA English
AB An automobile body reinforcing steel pipe has a wall thickness-to-outer diameter ratio, t:D, defined by: 0.09-4.8 x 10-5 x L <= t/D <= 0.16-6.0 x 10-5 x L where L(mm) is a span of a bending load applied to the pipe. The pipe has a tensile strength of => 120 kgf/mm 2 and an elongation of => 10%, and is preferably made of a steel consisting of, in wt.%, 0.15-0.25 carbon, <= 1.8 manganese, <= 0.5 silicone, <= 0.04 titanium, 0.0003-0.0035 boron, and the balance of iron and unavoidable impurities including <= 0.0080 nickel. A process for producing the steel pipe comprises: coiling a hot rolled steel sheet at a temperature of => 600 deg C; electric welding the adjoining edges of the sheet to form a steel pipe; and quench hardening the pipe.
CC 61 Engineering Components and Structures
CT Patent; Reinforcing steels: Alloy development; Alloy development; Automotive bodies: Materials selection
ET D

L94 ANSWER 6 OF 11 METADEX COPYRIGHT 2002 CSA
AN 1993(6):61-641 METADEX
TI Automobile Body Reinforcing Steel Pipe.
AU Tanabe, H. (Nippon Steel); Yamazaki, K. (Nippon Steel)
PI US 5181974 26 Jan. 1993
AD 25 Nov. 1991
DT Patent
LA English
AB An automobile body reinforcing steel pipe has a wall thickness:outer diameter ratio, t:D, defined by: 0.09-4.8 x 10-5 x L <= t:D <= 0.16-6.0 x 10-5 x L where L(mm) is a span of a bending load applied to the pipe. The pipe has a tensile strength of => 120 kgf/mm 2, and an elongation of => 10%, and is preferably made of a steel consisting, in wt.%, of 0.15-0.25 carbon, <= 1.8 manganese, <= 0.5 silicon, <= 0.04 titanium, 0.0003-0.0035 boron, and the balance of iron and unavoidable impurities including <= 0.0080 nitrogen. A process for producing the steel pipe comprises: coiling a hot rolled steel sheet at a temperature of => 600 deg C; electric welding the adjoining edges of the sheet to form a steel pipe; and quench hardening the pipe.
CC 61 Engineering Components and Structures
CT Patent; Structural steels: End uses; Automotive components: Materials selection; Pipe

ET D

L94 ANSWER 7 OF 11 METADEX COPYRIGHT 2002 CSA
AN 1987(9):52-1667 METADEX
TI Production of 50, 55 kgf/mm 2 Class Hot Rolled C-Mn Steel Sheets by Controlled Cooling.
AU Hosoda, T.; Mimura, K.; Hashimoto, S.-i.
SO Kobe Res. Dev. (July 1986) 36, (3), 43-46
ISSN: 0373-8868
DT Journal
LA Japanese
AB For the purpose of developing C-Mn steel sheets for automotive use, optimum cooling patterns on the runout table and the following coiling conditions were investigated. Rapid cooling to the ferrite transformation nose, short holding at that temperature and subsequent rapid cooling to the coiling temperature increase both elongation and strength of the products through the formation of ductile ferrite and a hard second phase in the microstructure. The tensile strength exceeding 50 kgf/mm 2 and high stretch flangeability are achieved by coiling 0.15C-1.2Mn steel sheet below 500 deg C. The steel shows good weldability comparable with that of conventional Nb-bearing steel. 3 ref.-AA
CC 52 WORKING (FORMING)
CT Carbon manganese steels: Rolling; Cooling; Controlled rolling; Mechanical properties: Cooling effects; Coiling
ALI CM50, CM55 CCA: SCMN
ET C*Mn; C-Mn; C-1.2Mn; Nb

L94 ANSWER 8 OF 11 METADEX COPYRIGHT 2002 CSA
AN 1986(12):45-1236 METADEX
TI Effect of Controlled Cooling on the Mechanical Properties of As-Hot-Rolled Multi-Phase Steel Sheets.
AU Sudo, M.; Iwai, T.; Hashimoto, S.; Hosoda, T.; Hirata, K.
SO The Metallurgical Society/AIME. 420 Commonwealth Dr., Warrendale, Pennsylvania 15086, USA. 1986. 501-519. Accession Number: 86(12):72-499
Conference: Accelerated Cooling of Steel, Pittsburgh, Pennsylvania, USA, 19-21 Aug. 1985
DT Conference
LA English
AB The effects of cooling conditions after hot rolling chemical compositions on the microstructures and mechanical properties have been discussed. One of the most important points in determining manufacturing multi-phase low alloy steels is to obtain desired martensite and bainite contents and to purify ferrite grains through controlled-cooling and additions of Si and Cr. The first cooling rate of controlled-cooling influences the volume of ferrite transformation, ferrite purification and enrichment of carbon to retained austenite. The second cooling rate and coiling temperature change the nature of low temperature transformation products and the solute carbon content in ferrite. Silicon accelerates transformation and purification of ferrite and then improves the tensile strength time elongation values. Chromium increases hardenability and improves yield ratio. Mill trials of recommended C-Mn-Si-Cr composition were undertaken to confirm the compositional and processing variables evaluated in the laboratory. The application of these steel sheets, tri-phase steels, for wheel disks was also conducted. 9 ref.-AA
CC 45 FERROUS ALLOY PRODUCTION
CT Low alloy steels: Alloy development; Strip steel: Alloy development; Phase transformations: Cooling effects; Mechanical properties: Cooling effects; Microstructure: Cooling effects; Automotive wheels: Materials selection
ALI Fe-0.05C-1.50Mn-0.49Cr-0.036Al-0.02Si, Fe-0.04C-1.50Mn-0.51Si-0.032Al-0.01Cr, Fe-0.05C-1.56Mn-0.49Si-0.48Cr-0.032Al CCA: SAL;

Fe-0.05-C1.52Mn-1.03Cr-0.52Si-0.031Al, Fe-0.06C-1.55Mn-1.43Cr-0.50Si-0.029Al, Fe-0.04C-1.52Mn-0.97Si-0.035Al-0.02Cr CCA: SAL; Fe-0.05C-1.55Mn-0.97Si-0.51Cr-0.037Al, Fe-0.05C-1.55Mn-1.02Cr-1.01Si-0.040Al, Fe-0.08C-0.97Mn-0.94Si-0.46Cr-0.034Al CCA: SAL; Fe-0.08C-0.92Si-0.75Mn-0.46Cr-0.030Al, Fe-0.08C-1.21Mn-0.94Si-0.69Cr-0.033Al, Fe-0.08C-1.33Mn-0.41Si-0.035Al-0.03Nb CCA: SAL

ET As; Si; Cr; C*Cr*Mn*Si; C sy 4; sy 4; Cr sy 4; Mn sy 4; Si sy 4; C-Mn-Si-Cr; C*Al*Cr*Fe*Mn*Si; C sy 6; sy 6; Al sy 6; Cr sy 6; Fe sy 6; Mn sy 6; Si sy 6; Fe-0.05C-1.50Mn-0.49Cr-0.036Al-0.02Si; Fe-0.04C-1.50Mn-0.51Si-0.032Al-0.01Cr; Fe-0.05C-1.56Mn-0.49Si-0.48Cr-0.032Al; Fe; C*Al*Cr*Mn*Si; C sy 5; sy 5; Al sy 5; Cr sy 5; Mn sy 5; Si sy 5; C1.52Mn; C cp; cp; Mn cp; C1.52Mn-1.03Cr-0.52Si-0.031Al; Fe-0.06C-1.55Mn-1.43Cr-0.50Si-0.029Al; Fe-0.04C-1.52Mn-0.97Si-0.035Al-0.02Cr; Fe-0.05C-1.55Mn-0.97Si-0.51Cr-0.037Al; Fe-0.05C-1.55Mn-1.02Cr-1.01Si-0.040Al; Fe-0.08C-0.97Mn-0.94Si-0.46Cr-0.034Al; Fe-0.08C-0.92Si-0.75Mn-0.46Cr-0.030Al; Fe-0.08C-1.21Mn-0.94Si-0.69Cr-0.033Al; C*Al*Fe*Mn*Nb*Si; Nb sy 6; Fe-0.08C-1.33Mn-0.41Si-0.035Al-0.03Nb

L94 ANSWER 9 OF 11 METADEX COPYRIGHT 2002 CSA
AN 1986(5):45-420 METADEX
TI Phosphorus-Added, Hot-Rolled, High-Strength Sheet Steel With Low Yield-to-Tensile Strength Ratio.
AU Irie, T.; Kato, T.; Tosaka, A.; Shinozaki, M.; Hashiguchi, K.
NR SAE Tech. Paper No. 850118
SO Society of Automotive Engineers, Inc.. 400 Commonwealth Dr., Warrendale, Pennsylvania 15096, USA. 1985. Pp 10. Accession Number: 86(5):72-168 Conference: International Conference & Exposition, Detroit, Michigan, USA, 25 Feb.-1 Mar. 1985
DT Conference; Report
LA English
AB A new hot rolled high strength sheet steel has been developed by utilizing controlled cooling technique after hot rolling a 0.05C-1.5Mn-0.08P steel. Phosphorus enhances ferrite transformation at higher temp., which results in a fine dispersion of austenite phase during the cooling step after hot rolling. At lower temp., P retards austenite decomposition and enhances martensite transformation when the strip is coiled at 250 deg C or below. This new high strength steel exhibits low yield-to-tensile strength ratio of 60-70%, while in conventional high strength steels, for example, a 0.15C-1.50Mn steel hot rolled and coiled at 400 deg C or below after rapid cooling, the yield ratio is approx 75%. It exhibits higher ductility, good stretch-flangeability, good fatigue property, good weldability and extremely high bake-hardenability compared to the C-Mn steel. Embrittleness due to segregation of P to grain boundaries was not observed in sheets and welded joints. This high strength steel has also good paintability and is now under commercial production for wheel discs or chassis components. 5 ref.-AA
CC 45 FERROUS ALLOY PRODUCTION
CT Automotive wheels: Materials selection; Rephosphorized steels: Alloy development; Hot rolling; Tensile properties; Drawability; Stretch forming; Fatigue life; Weldability
ALI RHA55L CCA: SCL
ET C*Mn*P; C-1.5Mn-0.08P; P; C*Mn; C-1.50Mn; C-Mn

L94 ANSWER 10 OF 11 METADEX COPYRIGHT 2002 CSA
AN 1985(12):52-2209 METADEX
TI Automotive High Strength Steel Sheets.
SO World Steel (Jpn.) (1985) (6), 34-41
DT Journal
LA Japanese
AB Several types of high strength steels have been developed with a min. loss

in press-formability and with good bake hardenability (BH). Steel sheets of 50-60 kgf/mm 2 class in tensile strength are now mass-produced for automotive application. The metallurgical principle, manufacturing process and characteristics are briefly described for three cold-rolled steels: dual-phase, BH-type rephosphorized, and deep drawn high strength steel. Dual-phase is a dispersion of martensite in a ferrite matrix and is produced by continuous annealing and rapid cooling. The other two are low carbon solid solution strengthened steels. A new process has been developed to produce hot-rolled dual-phase. Steel containing > 1% Mn or Mn + Si or P is hot-rolled, rapid-cooled, and coiled at < 400 deg C. Increased future application is anticipated because of its advantage in weight reduction.-F.S.

CC 52 WORKING (FORMING)

CT Dual phase steels: Metal working; Rephosphorized steels: Metal working; Sheet metal: Metal working; Automotive bodies: Metal working; Press forming; Deep drawing; Hardenability; Tensile properties

ET B*H; BH; B cp; cp; H cp; Mn; Si; P

L94 ANSWER 11 OF 11 METADEX COPYRIGHT 2002 CSA

AN 1982(9):61-667 METADEX

TI Development of Hot-Rolled Dual Phase Steel Sheets with Excellent Ductility.

AU Kunishige, K.; Takahashi, M.; Sugisawa, S.; Hammatsu, S.

SO Sumitomo Met. (Oct. 1981) 33, (4), 497-510

DT Journal

LA Japanese

AB As-rolled dual phase (DP) steel sheets containing small amounts of alloying elements, characterized by the accelerated cooling method have been studied in a laboratory. Trial manufactures were carried out, using the results obtained. It was revealed that DP steel sheets of 50 kgf/mm 2 to 80 kgf/mm 2 level in tensile strength with excellent ductility are obtained when plain carbon steels are finish-rolled just above the Ar3 point, accelerated-cooled and then coiled just below the M s point. The rolling and cooling conditions are related to refining the DP structure and also related to the decrease of solute carbon atoms in the ferrite matrix, resulting in the desired properties. It was also confirmed that this type of DP steel sheet shows high bake-hardening properties due to a considerable amount of solute nitrogen atom. 18 ref.-AA.

CC 61 ENGINEERING COMPONENTS AND STRUCTURES

CT Automotive bodies; Strip steel: Alloy development; Dual phase steels: Alloy development; Tensile strength; Ductility

ALI Fe-0.05C-0.32Mn CCA: SCL; Fe-0.12C-1.4Mn-0.11V CCA: SALHS; Fe-0.08C-1.53Mn-0.035Al,Fe-0.07C-0.52Si-1.58Mn-0.052Al-0.0068N CCA: SAM; Fe-0.08C-0.44Si-1.53Mn-0.039Al,Fe-0.08C-0.49Si-1.83Mn-0.049Al-0.0070N CCA: SAM; Fe-0.08C-1.53Mn-0.035Al-Si,Fe-0.08C-0.5Si-1.85Mn-0.04Al CCA: SAM; Fe-0.08C-0.52Si-1.88Mn-0.052Al-0.0075N CCA: SAM; Fe-0.08C-0.44Si-1.53Mn-0.039Al-0.0072N CCA: SAM; Fe-0.08C-0.44Si-1.53Mn-0.04Al-0.0072N CCA: SAM; Fe-0.05C-1.53Si-1.62Mn-0.51Cr-0.25Mo-0.07Al-0.0053N CCA: SALHS; Fe-0.10C-0.44Si-1.32Mn-0.05Al-0.008N CCA: SAM

ET Ar3; C*Fe*Mn; C sy 3; sy 3; Fe sy 3; Mn sy 3; Fe-0.05C-0.32Mn; C*Fe*Mn*V; C sy 4; sy 4; Fe sy 4; Mn sy 4; V sy 4; Fe-0.12C-1.4Mn-0.11V; C*Al*Fe*Mn; Al sy 4; Fe-0.08C-1.53Mn-0.035Al; C*Al*Fe*Mn*N*Si; C sy 6; sy 6; Al sy 6; Fe sy 6; Mn sy 6; N sy 6; Si sy 6; Fe-0.07C-0.52Si-1.58Mn-0.052Al-0.0068N; C*Al*Fe*Mn*Si; C sy 5; sy 5; Al sy 5; Fe sy 5; Mn sy 5; Si sy 5; Fe-0.08C-0.44Si-1.53Mn-0.039Al; Fe-0.08C-0.49Si-1.83Mn-0.049Al-0.0070N; Fe-0.08C-1.53Mn-0.035Al-Si; Fe-0.08C-0.5Si-1.85Mn-0.04Al; Fe-0.08C-0.52Si-1.88Mn-0.052Al-0.0075N; Fe-0.08C-0.44Si-1.53Mn-0.039Al-0.0072N; Fe-0.08C-0.44Si-1.53Mn-0.04Al-0.0072N; C*Al*Cr*Fe*Mn*Mo*N*Si; C sy 8; sy 8; Al sy 8; Cr sy 8; Fe sy 8; Mn sy 8; Mo sy 8; N sy 8; Si sy 8; Fe-0.05C-1.53Si-1.62Mn-0.51Cr-0.25Mo-0.07Al-0.0053N; Fe-0.10C-0.44Si-

1.32Mn-0.05Al-0.008N

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FILE LAST UPDATED: 11 SEP 2002 <20020911/UP>
FILE COVERS APR 1973 TO MAY 31, 2002

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=> d L121 1-24 ibib abs ind

L121 ANSWER 1 OF 24 JAPIO COPYRIGHT 2002 JPO
ACCESSION NUMBER: 2002-146478 JAPIO
TITLE: HIGH **TENSILE** STRENGTH COLD ROLLED **STEEL SHEET** HAVING HIGH r-VALUE, EXCELLENT **STRAIN AGE HARDENING** CHARACTERISTIC AND COLD NON-**AGING** PROPERTY AND ITS **PRODUCTION** METHOD
INVENTOR: TOSAKA AKIO; KAMI TSUTOMU
PATENT ASSIGNEE(S): KAWASAKI STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002146478	A	20020522	Heisei	C22C038-00

APPLICATION INFORMATION
STN FORMAT: JP 2000-335803 20001102
ORIGINAL: JP2000335803 Heisei
PRIORITY APPLN. INFO.: JP 2000-335803 20001102
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002

AN 2002-146478 JAPIO
AB PROBLEM TO BE SOLVED: To provide a high **tensile** strength cold rolled **steel sheet** having high formability and excellent **strain age hardening** characteristics and suitable for automobile parts requiring formability of a relatively high grade and to provide its inexpensive **production** method.
SOLUTION: A **steel** slab having a composition containing 0.025 to 0.15% C, in which the contents of Si, Mn, P and S are controlled in optimum ranges, and containing <=0.02% Al and 0.0050 to 0.0250% N and also satisfying N/Al: >=0.3 is heated at >=1,000°C and is subjected to **hot** finish **rolling** where FDT is >=800°C. After the finish of the **hot** finish **rolling**, the **steel** is rapidly **cooled** at >=40°C/s and is **coiled** at <=650°C. The **steel** is next cold-rolled. The **steel** is thereafter subjected to box annealing at the recrystallization temperature to 800°C and the subsequent continuous annealing in a two phase region. The **steel** is rapidly **cooled** to **form** a cold rolled **steel sheet** having a structure where the area ratio of **ferrite** with the average grain

size of <=10 μm is >=80%, and that of **martensite** is >=2%, containing solid solution N by >=0.0010% and having an (r) value of >=1.3, excellent **strain age hardening** characteristics and non-**aging** properties.

IC ICM C22C038-00
ICS B21B003-00; C21D009-46; C22C038-06; C22C038-58

L121 ANSWER 2 OF 24 JAPIO
ACCESSION NUMBER: 2002-129286 JAPIO
TITLE: **STEEL SHEET** WITH **STRAIN** INDUCED TRANSFORMATION TYPE COMPOSITE STRUCTURE HAVING EXCELLENT BURRING WORKABILITY AND ITS **PRODUCTION** METHOD
INVENTOR: YOKOI TATSUO; TAKAHASHI MANABU; OKADA HIROYUKI
PATENT ASSIGNEE(S): NIPPON STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002129286	A	20020509	Heisei	C22C038-00

APPLICATION INFORMATION
STN FORMAT: JP 2000-330191 20001030
ORIGINAL: JP2000330191 Heisei
PRIORITY APPLN. INFO.: JP 2000-330191 20001030
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002
AN 2002-129286 JAPIO
AB PROBLEM TO BE SOLVED: To provide a **hot rolled** **steel sheet** having fatigue characteristics and burring workability (hole expandability) and having **tensile** strength of >=540 MPa and to provide a **production** method for inexpensively and stably **producing** the **steel sheet.**
SOLUTION: This **steel sheet** with a **strain** induced transformation type composite structure having excellent burring workability is composed of **steel** containing 0.01 to 0.3% C, 0.01 to 2% Si, 0.05 to 3% Mn, <=0.1% P, <=0.01% S and 0.005 to 1% Al, and whose microstructure is composed of the composite one containing retained austenite of 5 to 25% by volume fraction, and the balance mainly **ferrite** and bainite, in which the value obtained by dividing the volume fraction of retained austenite by its average grain size is 3 to 12, and also, the value obtained by dividing the average value of the **hardness** of retained austenite by the average value of the **hardness** of **ferrite** is 1.5 to 7, and, in the method for **producing** the same **steel sheet, steel** having the above components is subjected to **hot** finish **rolling** so as to be finished at the Ar3 transformation point temperature to the Ar3 transformation point temperature +100°C, is thereafter retained at the temperature range of the Ar1 transformation point temperature to the Ar3 transformation point temperature in 1 to 20 seconds and, is **cooled** at a **cooling** rate of >=20°C/s and is **coiled** at a **coiling** temperature at the temperature range of >350 to <450°C.

IC ICM C22C038-00
ICS B21B003-00; C21D008-02; C21D009-46; C22C038-06; C22C038-58

L121 ANSWER 3 OF 24 JAPIO
ACCESSION NUMBER: 2002-129279 JAPIO

TITLE: ULTRAHIGH STRENGTH **HOT ROLLED** **STEEL SHEET** HAVING EXCELLENT **STRAIN AGE HARDENING** CHARACTERISTICS AND ITS **PRODUCTION** METHOD
INVENTOR: KAWABE HIDENAO; TOSAKA AKIO; FURUKIMI OSAMU
PATENT ASSIGNEE(S): KAWASAKI STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002129279	A	20020509	Heisei	C22C038-00

APPLICATION INFORMATION
STN FORMAT: JP 2001-162628 20010530
ORIGINAL: JP2001162628 Heisei
PRIORITY APPLN. INFO.: JP 2000-246701 20000816
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002

AN 2002-129279 JAPIO
AB PROBLEM TO BE SOLVED: To provide an ultrahigh strength **hot rolled steel sheet** having excellent **strain age hardening** characteristics and capable of sufficiently contributing to the lightening of an automobile body and to provide its **production** method.
SOLUTION: This **hot rolled steel sheet** containing solid solution Ni of >=0.0010% and having the average crystal grain size of <=10 μm is **produced** by heating a **steel** slab having a composition containing 2.5 to 3.5% Mn, 0.001 to 0.050% Ti, 0.005 to 0.100% Nb and 0.0050 to 0.0250% N and also satisfying >=0.3 N/Al at >=1,000°C, thereafter subjecting the slab to rough rolling into a **sheet** bar, subjecting the **sheet** bar to finish rolling so as to control the outlet side temperature in the finish rolling to >=800°C, within 0.5 sec after that, performing **cooling** at a **cooling** rate of >=40°C/s and **coiling** the same at <=650°C.

IC ICM C22C038-00
ICS C21D009-46; C22C038-14; C22C038-58

L121 ANSWER 4 OF 24 JAPIO
ACCESSION NUMBER: 2002-053935 JAPIO
TITLE: HIGH **TENSILE** STRENGTH COLD-ROLLED **STEEL SHEET** EXCELLENT IN **STRAIN AGE-HARDENING** CHARACTERISTIC AND ITS **PRODUCTION** METHOD
INVENTOR: KAMI TSUTOMU; OKUDA KANEHARU; TOSAKA AKIO; OSAWA KAZUNORI; YAMAZAKI TAKUYA; ISHIKAWA TAKASHI; KANEKO SHINJIRO
PATENT ASSIGNEE(S): KAWASAKI STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002053935	A	20020219	Heisei	C22C038-00

APPLICATION INFORMATION
STN FORMAT: JP 2001-54706 20010228
ORIGINAL: JP2001054706 Heisei
PRIORITY APPLN. INFO.: JP 2000-53923 20000229
PRIORITY APPLN. INFO.: JP 2000-151170 20000523

PRIORITY APPLN. INFO.: JP 2000-162497 20000531
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002

AN 2002-053935 JAPIO
AB PROBLEM TO BE SOLVED: To provide a high **tensile** strength **steel sheet** excellent in **strain age-hardenability** and suitable as the one for an automobile body and to provide its **production** method.
SOLUTION: A slab having a composition containing <=0.02% Al and 0.0050 to 0.0250% N, and in which N/Al is controlled to >=0.3 is subjected to **hot rolling** so as to satisfy FDT: >=800°C and is thereafter **coiled** at CT: <=750°C. Next, after cold rolling, the **steel** is subjected to continuous annealing at a temp. of the recrystallization temperature to 900°C, primary **cooling** of being rapidly **cooled** to <=500°C and secondary **cooling** in which residence time in the temperature range of the primary **cooling** stopping temperature to >=400°C is controlled to <=300 s to **form** a **steel sheet** having a structure containing an Fe phase with a grain size of <=10 μm by >=50% and containing N in a solid solution state by >=0.0010%. Further, **cooling** may be performed to <=600°C at <=70°C/s after the continuous annealing, or further, overaging treatment may be performed. Moreover, it is possible that the continuous annealing temperature is controlled to the two phase region of Ac1 to Ac3, and **cooling** in which the average **cooling** rate from 600 to 300°C is controlled to CR defined in accordance with the contents of the alloy elements or above is performed to **form** a structure containing an F phase by >=50% and an M phase by >=3%.
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IC ICM C22C038-00
ICS B21B003-00; C21D009-46; C22C038-06; C22C038-58

L121 ANSWER 5 OF 24 JAPIO COPYRIGHT 2002 JPO
ACCESSION NUMBER: 2002-053931 JAPIO
TITLE: COLD-ROLLED **STEEL SHEET** EXCELLENT IN **STRAIN AGE-HARDENING** CHARACTERISTIC AND ITS **PRODUCTION** METHOD
INVENTOR: TOSAKA AKIO; KAMI TSUTOMU
PATENT ASSIGNEE(S): KAWASAKI STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002053931	A	20020219	Heisei	C22C038-00

APPLICATION INFORMATION
STN FORMAT: JP 2001-161947 20010530
ORIGINAL: JP2001161947 Heisei
PRIORITY APPLN. INFO.: JP 2000-162498 20000531
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002

AN 2002-053931 JAPIO
AB PROBLEM TO BE SOLVED: To provide a cold-rolled **steel sheet** excellent in **strain age-hardenability** and suitable as the one for an automobile body and to provide its **production** method.
SOLUTION: A slab having a composition containing <=0.15% C, <=0.02% Al and 0.0050 to 0.0250% N, and in which Si+Mn/5+10P is controlled to <0.44, and N/Al is controlled to >=0.3, is subjected to **hot-rolling** so as to satisfy FDT: >=800°C, is thereafter **coiled**, then

cold-rolled and thereafter, subjected to annealing at a temp. of the recrystallization temperature to 950°C, **cooling** after the annealing of being rapidly **cooled** to the temperature range of <=500°C and overaging treatment in which residence time in the temperature range of 350 to 500°C is >=20 s, to obtain the **steel sheet** excellent in **strain age-hardening** characteristics, having a structure composed of a ferritic phase with a grain size of <=15 μm by >=90%, and the balance pearlitic phase, containing solid solution N by >=0.0010% and having a **tensile** strength of <440 MPa and a yield ratio of <70%.

IC ICM C22C038-00
ICS B21B001-22; B21B003-00; C21D009-46; C22C038-06; C22C038-58

L121 ANSWER 6 OF 24 JAPIO
ACCESSION NUMBER: 2002-030385 JAPIO
TITLE: HIGH **TENSILE** STRENGTH AND HIGH WORKABILITY **HOT ROLLED STEEL** **SHEET** EXCELLENT IN **STRAIN** **AGE HARDENING** CHARACTERISTIC AND ITS **PRODUCTION** METHOD
INVENTOR: NAKAGAITO TATSUYA; TOSAKA AKIO; KANEKO SHINJIRO
PATENT ASSIGNEE(S): KAWASAKI STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002030385	A	20020131	Heisei	C22C038-00

APPLICATION INFORMATION
STN FORMAT: JP 2000-217275 20000718
ORIGINAL: JP2000217275 Heisei
PRIORITY APPLN. INFO.: JP 2000-217275 20000718
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002

AN 2002-030385 JAPIO
AB PROBLEM TO BE SOLVED: To provide a high **tensile** strength and high workability **hot rolled steel** **sheet** excellent in **strain age** **hardening** characteristics and capable of sufficiently contributing to the lightening of an automobile body and to provide its **production** method.
SOLUTION: This **hot rolled steel** **sheet** has a composition containing prescribed amounts of C, Si and Mn, <=0.02% Al and 0.0050 to 0.0250% N and satisfying N/Al>=0.30 and solid solution N>=0.0010% and a structure satisfying α(**ferrite**)>=50 vol.%, retained γ>=3.0 vol.% and α grain size <=10.0 μm. In the **hot rolling production** conditions, SRT=1,000 to 1,300°C, the draft in the finish final pass >=15% and/or the cumulative draft in the finish post-3 passes >=50%, FDT=780 to 980°C and CT=:300 to 500°C are controlled, and, in the meanwhile of FDT to CT, isothermal holding from FDT to T1 (620 to 780°C) at >=50°C/s for 1.0 to 10 sec or slow **cooling** to T2 (<T1 to 600°C) at <=20°C/s for 1.0 to 10 sec is performed, and the **steel sheet** is **coiled** at T3 (=CT) at >=50°C/s.

IC ICM C22C038-00
ICS C21D009-46; C22C038-06; C22C038-38

L121 ANSWER 7 OF 24 JAPIO COPYRIGHT 2002 JPO
ACCESSION NUMBER: 2001-335891 JAPIO
TITLE: HIGH **TENSILE STEEL SHEET** EXCELLENT IN DUCTILITY AND IMPACT RESISTANCE, AND ITS **PRODUCTION** METHOD
INVENTOR: KOJIMA HIROTATSU
PATENT ASSIGNEE(S): SUMITOMO METAL IND LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2001335891	A	20011204	Heisei	C22C038-00

APPLICATION INFORMATION
STN FORMAT: JP 2000-160296 20000530
ORIGINAL: JP2000160296 Heisei
PRIORITY APPLN. INFO.: JP 2000-160296 20000530
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2001
AN 2001-335891 JAPIO
AB PROBLEM TO BE SOLVED: To provide a high strength **steel sheet** excellent in collision strength as well as in formability and reduced in cost, and provide its **production** method. SOLUTION: The **steel sheet** has a composition containing 0.05-0.25% C, <=2.0% Si, 0.005-2.0% Al, 0.8-2.5% Mn and <=0.05% P and satisfying (Si+Al)=1.0 to 2.5%, and further, the Vickers **hardness** of the **steel sheet**, after being subjected to preforming treatment accompanied with stretch bending deformation of 10% **strain** in **sheet- thickness** direction and to baking treatment consisting of holding the **steel sheet** at 170°C for 20 min, satisfies (HVs-HVc)/HV0>=0.12 (wherein, HV0 is **hardness** in the **sheet-thickness** central part before the preforming; HVc is **hardness** in the **sheet-thickness** central part after the preforming and baking treatments; and HVs is **hardness** in the surface part after the preforming and baking treatments). The **steel sheet** can be **manufactured** by successively carrying out finish rolling at 1,050-800°C, **cooling** to 750°C at a rate of >=20°C/s, and **coiling** at a temperature not higher than 700°C but not lower than Tc (where Tc satisfies Tc(°C)=430+70×Mn(%)+1000×P(%)), subjecting the resultant **hot rolled** plate to cold rolling at 40-80%, and then subjecting the resultant **steel sheet** to the holding in a two-phase region for 30-90 s, **cooling** through the temperature region from 700 to 450°C at a rate of >=30°C/s, and the holding at 450-370°C for 200-400 s to apply annealing.
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IC ICM C22C038-00
ICS B21B003-00; C21D009-46; C22C038-06; C22C038-16

L121 ANSWER 8 OF 24 JAPIO COPYRIGHT 2002 JPO
ACCESSION NUMBER: 2001-303187 JAPIO
TITLE: DUAL-PHASE **STEEL SHEET** EXCELLENT IN BURRING PROPERTY, AND ITS **MANUFACTURING** METHOD
INVENTOR: YOKOI TATSUO; TAKAHASHI MANABU
PATENT ASSIGNEE(S): NIPPON STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC

JP 2001303187	A	20011031	Heisei	C22C038-00

APPLICATION INFORMATION
STN FORMAT: JP 2000-121210 20000421
ORIGINAL: JP2000121210 Heisei
PRIORITY APPLN. INFO.: JP 2000-121210 20000421
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2001

AN 2001-303187 JAPIO
AB PROBLEM TO BE SOLVED: To **produce** a **hot rolled** **steel sheet** having >=540 MPa **tensile** strength and excellent in fatigue characteristic and burring property (bore expandability) and also to provide a **manufacturing** method for stably **manufacturing** this **steel sheet** at a low cost.
SOLUTION: The dual-phase **steel sheet** excellent in burring property is composed of **steel** having a composition containing, by mass, 0.01-0.2% C, 0.01-2% Si, 0.05-3% Mn, <=0.1% P, <=0.01% S and 0.005-1% Al and has a microstructure consisting of a dual-phase structure in which a phase having maximum volume fraction is composed of **ferrite** and a second phase is composed essentially of **martensite**; a value given by dividing the volume fraction of the second phase by the average grain size of the second phase is 3-12; and a value given by dividing the average value of the **hardness** of the second phase by the average value of the **hardness** of **ferrite** is 1.5-7. This **steel sheet** can be **manufactured** by finishing the **hot** finish **rolling** of the **steel** with the above composition at a temperature between the Ar3 transformation point and (Ar3 transformation point + 100°C), holding the resultant **steel sheet** in the temperature region between the Ar1 transformation point and the Ar3 transformation point for 1-20 s, **cooling** the **steel sheet** at >=20°C/s **cooling** rate, and then **coiling** it at <=350°C **coiling** temperature.
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IC ICM C22C038-00
ICS B21B003-00; C21D009-46; C22C038-06; C22C038-58

L121 ANSWER 9 OF 24 JAPIO COPYRIGHT 2002 JPO
ACCESSION NUMBER: 2001-303180 JAPIO
TITLE: HIGH YIELD RATIO TYPE HIGH TENSION GALVANIZED **STEEL SHEET** EXCELLENT IN WORKABILITY AND **STRAIN AGING HARDENING** CHARACTERISTIC, AND ITS **PRODUCING** METHOD
INVENTOR: OSAWA KAZUNORI; TOSAKA AKIO; KANEKO SHINJIRO; FURUKIMI OSAMU
PATENT ASSIGNEE(S): KAWASAKI STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2001303180	A	20011031	Heisei	C22C038-00

APPLICATION INFORMATION
STN FORMAT: JP 2000-120715 20000421
ORIGINAL: JP2000120715 Heisei
PRIORITY APPLN. INFO.: JP 2000-120715 20000421
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2001

AN 2001-303180 JAPIO
AB PROBLEM TO BE SOLVED: To **produce** a high yield ratio type high tension galvanized **steel sheet** which is excellent in the workability and **strain aging hardening** characteristics and which can stably secure the high strength of parts for a car body, and to provide a **producing** method by which this galvanized **steel sheet** can stably be **produced**
.
SOLUTION: Heat treatment from Ac1 point to Ac3 point + 100°C and successive galvanization are applied to a **hot-rolled sheet** or a cold-rolled **sheet** having the composition containing <=0.20% C, <=2.0% Si, <=3.0% Mn, <=0.08% P, <=0.02% S, <=0.02% Al, 0.0050-0.0250% N, 0.005-0.50% Nb and >=3 N/Al, and after **forming** a galvanized layer on the surface, **cooling** is performed. It is desirable to apply annealing at a **temperature** not **lower** than Ac1 before the heat treatment and the **cooling** and successively to apply pickling. Further, it is desirable that the **cooling** is started within 0.5 sec after finish-rolling and the rapid-**cooling** is performed at >=40°C/s **cooling** rate prior to the **coiling**.

IC ICM C22C038-00
ICS B21B003-00; B21B045-00; C21D009-48; C22C038-12; C22C038-58; C23C002-02; C23C002-06; C23C002-28; C23C002-40

L121 ANSWER 10 OF 24 JAPIO
ACCESSION NUMBER: 2001-226744 JAPIO
TITLE: HIGH **TENSILE** STRENGTH FOR ROLLED **STEEL SHEET** EXCELLENT IN BACKING **HARDENABILITY** AND IMPACT RESISTANCE AND **PRODUCING** METHOD THEREFOR
INVENTOR: KAMI TSUTOMU; YAMAZAKI TAKUYA; KANEKO SHINJIRO; TOSAKA AKIO
PATENT ASSIGNEE(S): KAWASAKI STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2001226744	A	20010821	Heisei	C22C038-00

APPLICATION INFORMATION
STN FORMAT: JP 2000-36756 20000215
ORIGINAL: JP2000036756 Heisei
PRIORITY APPLN. INFO.: JP 2000-36756 20000215
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2001
AN 2001-226744 JAPIO
AB PROBLEM TO BE SOLVED: To provide a **hot rolled steel sheet** improved in both baking **hardenability** and impact resistance in a high strength **hot rolled steel sheet** having **tensile** strength of 440 MPa or more and suitable as an automotive interior material and to provide a **producing** method therefor.
SOLUTION: This high **tensile** strength **hot rolled steel sheet** excellent in baking **hardenability** and impact resistance has a composition containing 0.01 to 0.16% C, <=2.0% Si, <=3.0% Mn, 0.005 to 0.2% P, 0.001 to 0.1% Al, >0.0060 to 0.0200% N inclusive of 0.0030 to 0.0100% solid solution N, and the balance Fe with inevitable impurities and a structure composed of **ferrite** of **ferrite** with the average crystal grain size

of <=7.0 μm as the main phase and has **tensile** strength of 440 to 840 MPa and **strain aging** strengthening capacity of >80 MPa. In the **producing** method for the above **hot rolled steel sheet**, a **steel** stock containing C, Si, Mn, P, Al and N by the above amounts is heated, is subjected to rough rolling, is thereafter subjected finish rolling in which the total draft of the final three passes is 15 to 65%, and FDT comes to the high temperature side of Ar3 by 10 to 100°C, is rapidly **cooled** within 0.5 sec after that and is **coiled**.
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IC ICM C22C038-00
ICS C21D009-46; C22C038-06; C22C038-58

L121 ANSWER 11 OF 24 JAPIO COPYRIGHT 2002 JPO
ACCESSION NUMBER: 1998-317096 JAPIO
TITLE: HIGH STRENGTH **STEEL SHEET** FOR AUTOMOBILE USE, EXCELLENT IN COLLISION-PROOF STABILITY, AND ITS **PRODUCTION**
INVENTOR: KONO OSAMU; WAKITA JUNICHI; MABUCHI HIDESATO
PATENT ASSIGNEE(S): NIPPON STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 10317096	A	19981202	Heisei	C22C038-00

APPLICATION INFORMATION
STN FORMAT: JP 1998-80546 19980313
ORIGINAL: JP10080546 Heisei
PRIORITY APPLN. INFO.: JP 1997-82434 19970317
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1998
AN 1998-317096 JAPIO
AB PROBLEM TO BE SOLVED: To stably obtain a high strength **steel sheet** for automobile use, excellent in collision stability, at a low cost by raising a **strain hardening** exponent and controlling yield strength and the **strain hardening** exponent to values in specific ranges, respectively. SOLUTION: A **steel** slab, which has a composition consisting of, by weight, >0.04-0.25% C, 0.15-3.5% of Mn and/or Cr, 0.01-4.0% of Si and/or Al, and the balance essentially Fe and containing, if necessary, <=0.2% P, <=0.02% S, 0.0005-0.01% Ca and/or 0.005 0.05% REM, <=3.5% of one or more elements among Ni, Cu, and Mo, further <=0.3% of one or more elements among Nb, Ti, and V, and <=0.01% B, is used. This **steel** slab is **hot rolled** under the conditions of >=25 mm initial **steel** slab **thickness**, 760-920°C finishing temp., >=500 mpm final pass rolling velocity, **cooled**, and further **coiled** at <=350°C. By this method, the **steel sheet** having a structure in which **martensite** volume occupancy, **strain hardening** exponent, and the value of [yield strength × **strain hardening** exponent] are regulated to >=3%, >=0.130, and >=70, respectively, can be obtained.
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IC ICM C22C038-00
ICS C21D008-02; C21D009-46; C22C038-38; C22C038-58

L121 ANSWER 12 OF 24 JAPIO COPYRIGHT 2002 JPO
ACCESSION NUMBER: 1998-008201 JAPIO
TITLE: **STEEL SHEET** FOR DEEP DRAWING, AND ITS **PRODUCTION**

INVENTOR: NAKAZAWA YOSHIAKI; NOMURA SHIGEKI; NAKAI SHUJI
PATENT ASSIGNEE(S): SUMITOMO METAL IND LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 10008201	A	19980113	Heisei	C22C038-00

APPLICATION INFORMATION
STN FORMAT: JP 1996-179994 19960620
ORIGINAL: JP08179994 Heisei
PRIORITY APPLN. INFO.: JP 1996-179994 19960620
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1998

AN 1998-008201 JAPIO
AB PROBLEM TO BE SOLVED: To provide a stability-providing means for a high strength **steel sheet** for deep drawing, excellent in resistance to secondary working brittleness as well as in baking **hardenability** and **aging** characteristics and having >=340MPa **tensile** strength.
SOLUTION: The **steel sheet** for deep drawing is constituted so that it has a composition which consists of 0.0030-<0.010% C, <=0.2% Si, 0.07-0.25% Mn, <=0.05% P, <=0.015% S, 0.01-0.04% Nb, 0.01-0.1% Al, <=0.005% N, and the balance Fe with inevitable impurities or further contains 0.0003-0.0030% B and in which the amount of Ti satisfies the condition of inequality (48/14) N[%]<=Ti[%]<=(48/14)N-[%]+(48/32)S[%] and the amount of Cal.Sol.C and the amount of Mn satisfy the condition of inequality 25<=10000×Cal.Sol. C[%]-420×Mn[%]+80<=55, where Cal.Sol.C[%]=Total.C[%]-(12/93)Nb[%] is satisfied. Moreover, this **steel sheet** can be **produced** by subjecting a **steel** slab to **hot rolling** and to **coiling** at **low temp**. and then applying cold rolling and recrystallization treatment by continuous annealing to the resultant **steel plate**.
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IC ICM C22C038-00
ICS C21D008-04; C21D009-48; C22C038-14

L121 ANSWER 13 OF 24 JAPIO COPYRIGHT 2002 JPO
ACCESSION NUMBER: 1997-296252 JAPIO
TITLE: THIN **HOT ROLLED STEEL SHEET** EXCELLENT IN FORMABILITY AND ITS **PRODUCTION**
INVENTOR: TOSAKA AKIO; FURUKIMI OSAMU
PATENT ASSIGNEE(S): KAWASAKI STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 09296252	A	19971118	Heisei	C22C038-00

APPLICATION INFORMATION
STN FORMAT: JP 1996-111567 19960502
ORIGINAL: JP08111567 Heisei
PRIORITY APPLN. INFO.: JP 1996-111567 19960502
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1997

AN 1997-296252 JAPIO
AB PROBLEM TO BE SOLVED: To **produce** a thin **hot rolled steel sheet** showing good formability

even in the tip part in the **width** direction by specifying the **steel** componental compsn., **hot rolling** conditions, the quantity of crowns and the relation between the same and the **sheet thickness**.
SOLUTION: A **steel** slab contg., by weight, 0.02 to 0.20% C, <=1.00% Si, 0.05 to 1.50% Mn, <=0.04% P, <=0.015% S, 0.005 to 0.150% Al, <=0.020% N, and the balance Fe is heated at <=1200°C and is subjected to rough rolling, and the obtd. **sheet** bar is **coiled** and is held hot. This is recoiled and is joined with the article preceding thereto, the **sheet width** edge part is heated in such a manner that its temp. is **made** higher than that of the **sheet width** center part by >=50°C, and finish continuous rolling using pair cross rolling in one or more stages is executed in the poststage. Next, it is air-**cooled** for >=2sec, is thereafter water-**cooled** in such a manner that **cooling** water from one or more directions of the upper and lower directions does not directly hit the edge part of the **steel sheet** and is **coiled**. Then, the **steel sheet** in which the **sheet thickness** is regulated to <=1.2mm, the quantity of crowns is regulated to <=30μm, and the ratio of the crown quantity/the **sheet thickness** is regulated to <0.030, having a ferritic structure free from **strains** over the whole **width** direction, and in which the surface **hardness** in the center part in the **width** direction does not fall below the surface **hardness** at a position of 5mm **sheet** edge in the **width** direction can be obtd.

IC ICM C22C038-00
ICS B21B003-00; C21D008-02; C21D009-46; C22C038-06; C22C038-54

L121 ANSWER 14 OF 24 JAPIO
ACCESSION NUMBER: 1997-165625 JAPIO
TITLE: **PRODUCTION** OF **STEEL SHEET** EXCELLENT IN BAKING **HARDENABILITY** AFTER BIAXIAL **TENSILE** DEFORMATION
INVENTOR: KITANO FUSAHITO; NAGATAKI YASUNOBU; HOSOYA YOSHIHIRO
PATENT ASSIGNEE(S): NKK CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 09165625	A	19970624	Heisei	C21D009-46

APPLICATION INFORMATION
STN FORMAT: JP 1995-327513 19951215
ORIGINAL: JP07327513 Heisei
PRIORITY APPLN. INFO.: JP 1995-327513 19951215
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1997
AN 1997-165625 JAPIO
AB PROBLEM TO BE SOLVED: To provide a method for **producing** a **steel sheet** suitably used for automobile outer **sheet** panel, etc., and having excellent baking finish **hardenability**.
SOLUTION: A **steel**, having a composition which consists of, by weight, 0.0005-0.005% C, <=1.0% Si, <=1.5% Mn, <=0.1% P, <=0.02% S, 0.01-0.1% sol.Al, <=0.005% N, 0.001-0.03% Nb, 0.0002-0.002% B, and the balance Fe with inevitable impurities and in which Nb/C (atomic equivalent ratio) and B/N (atomic equivalent ratio) are regulated to 0.4-0.8 and <=0.6, respectively, is refined. This **steel** is **hot**-

rolled at a **temp**. not **lower** than the Ar<SB>3</SB> point, **coiled** at >=600°C, and cold-rolled. After soaked in the **ferrite** single-phase region not **lower** than the recrystallization **temp**., the resultant **steel sheet** is **cooled** while regulating the **cooling** time (t)(min) to 600°C to a value in the range satisfying -0.6<=log(t)<=0.16(1-1050×B) and is successively **cooled** to 400°C at (0.5 to 200)°C/s average **cooling** rate.

IC ICM C21D009-46
ICS C21D008-02; C22C038-00; C22C038-12

L121 ANSWER 15 OF 24 JAPIO
ACCESSION NUMBER: 1995-109528 JAPIO
TITLE: **PRODUCTION** OF EXTRA THIN **STEEL SHEET** FOR WELDED CAN BODY, SUITABLE FOR HIGH SPEED WELDING
INVENTOR: MARUOKA KUNIAKI; OGA TOMOYA; SAKIYAMA TATSUYA; IKEDA MASAO; KONO TAKESHI
PATENT ASSIGNEE(S): NIPPON STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 07109528	A	19950425	Heisei	C21D009-48

APPLICATION INFORMATION
STN FORMAT: JP 1993-254571 19931012
ORIGINAL: JP05254571 Heisei
PRIORITY APPLN. INFO.: JP 1993-254571 19931012
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1995

AN 1995-109528 JAPIO
AB PURPOSE: To **produce** an extra thin **steel sheet** for welded can body, **hardly** causing lapping lelief and suitable for high speed welding, by regulating C content in a low carbon **steel** slab to a specific value and also specifying slab heating conditions prior to **hot rolling**, **hot rolling** conditions, and secondary cold rolling draft, respectively.
CONSTITUTION: A slab of a **steel**, which has a composition containing, by weight, >0.0060-<0.0600% C, <0.06% Si, 0.05-0.60% Mn, <0.06% P, <0.06% S, 0.05-0.10% acid soluble Al, and 0.0010-0.0300% N or further containing 0.005-0.10% Cr, is used. The slab is **cooled** down to a **temp**. **lower** than the Ar<SB>3</SB> transformation point, reheated to >=1050°C, and **hot-rolled**, or, the slab is **hot-rolled** at -900°C surface temp. in a high temp. state without **cooling** the slab down to a **temp**. **lower** than the Ar<SB>3</SB> transformation point. Then, **hot rolling** is finished at a **temp**. not **lower** than the Ar<SB>3</SB> transformation point, and **coiling** is done at <=680°C. The resulting **hot rolled** plate is pickled, cold-**rolled**, **heated** to 590-750°C, soaked at this temp. for >=10sec, **cooled**, and then subjected to secondary cold rolling at 2-10% draft. By this method, the **steel sheet**, having <0.26mm **sheet thickness**, >62 HR<SB>30-t</SB> **hardness**, >44kgf/mm<SP>2</SP> **tensile** strength in a rolling direction, can be obtained.

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IC ICM C21D009-48
ICS C21D008-04; C22C038-00; C22C038-06

L121 ANSWER 16 OF 24 JAPIO COPYRIGHT 2002 JPO
ACCESSION NUMBER: 1995-109525 JAPIO
TITLE: **PRODUCTION** OF EXTRA THIN **STEEL** **SHEET** FOR WELDED CAN BODY, SUITABLE FOR HIGH SPEED WELDING
INVENTOR: MARUOKA KUNIAKI; OGA TOMOYA; SAKIYAMA TATSUYA; IKEDA MASAO; KONO TAKESHI
PATENT ASSIGNEE(S): NIPPON STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 07109525	A	19950425	Heisei	C21D009-48

APPLICATION INFORMATION
STN FORMAT: JP 1993-254568 19931012
ORIGINAL: JP05254568 Heisei
PRIORITY APPLN. INFO.: JP 1993-254568 19931012
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1995
AN 1995-109525 JAPIO
AB PURPOSE: To **produce** an extra thin **steel sheet** for welded can body, **hardly** causing lapping relief and suitable for high speed welding, by regulating C content in a low carbon **steel** slab to a value in a specific range and also specifying slab heating conditions prior to **hot rolling**, **hot** **rolling** conditions, and secondary cold rolling draft, respectively.
CONSTITUTION: A slab of a low carbon **steel**, which has a composition containing, by weight, >0.0060-<0.0600% C, <0.06% Si, 0.05-0.60% Mn, <0.06% P, <0.06% S, 0.005-0.10% acid soluble Al, and 0.0010-0.010% N or further containing 0.005-0.1000% Cr, is used. The slab is **cooled** down to a **temp**. **lower** than the Ar<SB>3</SB> transformation point, reheated to >=1050°C, and **hot-rolled** and **hot rolling** is finished at a **temp**. not **lower** than the Ar<SB>3</SB> transformation point, or, **hot rolling** is started at >=900°C surface temp. in a high temp. state without **cooling** the slab down to a **temp**. **lower** than the Ar<SB>3</SB> transformation point and **hot rolling** is finished at a **temp**. not **lower** than the Ar<SB>3</SB> transformation point. Subsequently, the resulting **hot rolled** **steel** plate is **coiled** at <=680°C, pickled, cold-rolled, recrystallization-annealed, and subjected to secondary cold rolling at 2-10% draft. By this method, the extra thin **steel** **sheet** for welded can body, having <=0.26mm **sheet** **thickness**, >=62 H<SB>r30-</SB>T **hardness**, and 44kgf/mm<SP>2</SP> **tensile** strength in a rolling direction, can be **produced**.
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IC ICM C21D009-48
ICS C21D008-04; C22C038-00; C22C038-06

L121 ANSWER 17 OF 24 JAPIO COPYRIGHT 2002 JPO
ACCESSION NUMBER: 1995-062487 JAPIO
TITLE: HIGH STRENGTH AND HIGH WORKABILITY **STEEL**

SHEET FOR CAN **PRODUCING** EXCELLENT IN BAKING **HARDENABILITY, AGING** RESISTANCE AND NON-EARING
INVENTOR: TOSAKA AKIO; KUKUMINATO HIDEO; KATO TOSHIYUKI
PATENT ASSIGNEE(S): KAWASAKI STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 07062487	A	19950307	Heisei	C22C038-00

APPLICATION INFORMATION
STN FORMAT: JP 1993-211515 19930826
ORIGINAL: JP05211515 Heisei
PRIORITY APPLN. INFO.: JP 1993-211515 19930826
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1995
AN 1995-062487 JAPIO
AB PURPOSE: To **produce** a high strength and high workability **steel sheet** for can **producing** having non-earing property by **making** the combined structure of **ferrite** and pearlite by means of subjecting a **hot rolled** low carbon **sheet** to first rolling and second rolling.
CONSTITUTION: After the **steel** ingot consisting of, by weight, 0.08-0.15% C, <0.10% Si, 0.05-1.20% Mn, 0.02-0.15% Al, 0.015-0.15%P, <0.01% S, 0.0050-0.0120% N, and/or one or more of the specific small quantity of Ni, Cu, and B is **hot rolled** at a finish temp. of 850-930°C, it is immediately **cooled** at a **cooling** speed of >=50°C/sec and is **coiled** at 400-540°C, this **hot rolled sheet** is subjected to the first cold rolling at a draft of 70-90% after acid pickling treatment, further by holding at the temp. of 10-50°C higher than Ac<SB>1</SB> point and <=850°C for >=20sec, the **ferrite** structure with controlling the austenite quantity in the structure to 10-50% is obtained. Subsequently, it is **cooled** down to <=900°C at a **cooling** speed of >=70°C/sec, after holding at >=300°C for 20-60sec, it is subjected to the second cold rolling at a draft of 10-35%, the **steel sheet** for can **producing** of >50kbf/mm<SP>2</SP> **tensile** strength and >5% elongation is **produced**.
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IC ICM C22C038-00
ICS C21D008-02; C22C038-06; C22C038-16

L121 ANSWER 18 OF 24 JAPIO COPYRIGHT 2002 JPO
ACCESSION NUMBER: 1995-062486 JAPIO
TITLE: HIGH STRENGTH AND HIGH WORKABILITY **STEEL SHEET** FOR CAN **PRODUCING** EXCELLENT IN BAKING **HARDENABILITY, AGING** RESISTANCE AND NON-EARING
INVENTOR: TOSAKA AKIO; KUKUMINATO HIDEO; KATO TOSHIYUKI
PATENT ASSIGNEE(S): KAWASAKI STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 07062486	A	19950307	Heisei	C22C038-00

APPLICATION INFORMATION

STN FORMAT: JP 1993-211514 19930826
ORIGINAL: JP05211514 Heisei
PRIORITY APPLN. INFO.: JP 1993-211514 19930826
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1995

AN 1995-062486 JAPIO
AB PURPOSE: To develop a high strength and high workability **steel plate** for can **producing** having non-earing property by having the combined structure of **ferrite** and pearlite by means of first rolling and second rolling after a low carbon ingot is **hot rolled**.
CONSTITUTION: After the **steel** ingot consisting of, by weight, 0.08-0.15% C, <0.10% Si, 0.05-1.60% Mn, 0.02-0:15% Al, 0.015-0.15% P, <0.01% S, 0.0050-0.0120% N, and/or one or more of the specific small quantity of Ni, Cu, and B is **hot rolled** and is finished at 850-930°C, it is immediately **cooled** at a **cooling** speed of >=50°C/sec, after it is subjected to **coiling** and acid pickling treatment at 400-540°C, and then to the first cold rolling at a draft of 70-90%, further by holding at the temp. of 10-50°C higher than Ac<SB>1</SB> point and <=850°C for >=20sec, the **ferrite** structure with controlling the austenite quantity in the structure to 10-50% is obtained. Subsequently, it is **cooled** down to <=900°C at a **cooling** speed of >=70°C/sec, after holding at >=300°C for 20-60sec, it is subjected to the second cold rolling at a draft of 10-35%, the **steel sheet** for can **producing** of >50kbf/mm<SP>2</SP> **tensile** strength and >5% elongation is **produced**.
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IC ICM C22C038-00
ICS C21D008-02; C22C038-06; C22C038-16

L121 ANSWER 19 OF 24 JAPIO COPYRIGHT 2002 JPO
ACCESSION NUMBER: 1994-264138 JAPIO
TITLE: **PRODUCTION** OF **STEEL SHEET** FOR WELDED CAN EXCELLENT IN BLANK LAYOUT PROPERTY
INVENTOR: MARUOKA KUNIAKI; FURUNO YOSHIKUNI; OGA TOMOYA
PATENT ASSIGNEE(S): NIPPON STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 06264138	A	19940920	Heisei	C21D008-02

APPLICATION INFORMATION
STN FORMAT: JP 1993-52608 19930312
ORIGINAL: JP05052608 Heisei
PRIORITY APPLN. INFO.: JP 1993-52608 19930312
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1994

AN 1994-264138 JAPIO
AB PURPOSE: To obtain a high strength extra thin **steel sheet** free from restrictions in a blank layout direction by treating a **steel** slab having specific composition by combining **heating**, **rolling**, draft at secondary cold rolling, etc.
CONSTITUTION: A slab of a **steel**, having a composition consisting of, by weight, >0.0060-<0.0600% C, <=0.06% Si, 0.05-0.60% Mn, <=0.06% P, <=0.06% S, 0.005-0.100% acid soluble Al, >0.0100-0.0300% N, and the balance Fe with inevitable impurities, is **cooled** down to a **temp**. **lower** than the Ar<SB>3</SB> transformation point. Then, the **steel** slab is reheated to >=1050°C, **hot-**

rolled, and finished at a **temp**. not **lower** than the Ar<SB>3</SB> transformation point. The resulting **steel** plate is **coiled** at <=680°C, pickled, and cold-rolled. The resulting **steel sheet** is heated to 590-750°C, soaked for >=10sec, and **cooled**. Successively, the **sheet** is subjected to secondary cold rolling at 2 to <10% draft. By this method, the **steel sheet** for welded can, having >=0.26mm **sheet thickness**, >=62 HR<SB>30-</SB>T **hardness**, >=44kgf/ mm<SP>2</SP> **tensile** strength in rolling direction, and excellent blank layout property, can be obtained.
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IC ICM C21D008-02
ICS C21D009-46
ICA C22C038-00; C22C038-06

L121 ANSWER 20 OF 24 JAPIO COPYRIGHT 2002 JPO
ACCESSION NUMBER: 1993-255756 JAPIO
TITLE: **PRODUCTION** OF NON-**AGING** COLD ROLLED **STEEL SHEET** WITH **BH** CHARACTERISTIC
INVENTOR: SENUMA TAKEHIDE; KAWASAKI KAORU; MATSUMURA GIICHI
PATENT ASSIGNEE(S): NIPPON STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 05255756	A	19931005	Heisei	C21D009-46

APPLICATION INFORMATION
STN FORMAT: JP 1992-52940 19920311
ORIGINAL: JP04052940 Heisei
PRIORITY APPLN. INFO.: JP 1992-52940 19920311
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1993

AN 1993-255756 JAPIO
AB PURPOSE: To obtain a non-**aging** cold rolled **steel sheet** with **BH** characteristic by specifying the **hot rolling** temp., **coiling** temp., and annealing conditions, respectively, at the time of **producing** a **steel** containing specific percentages of C, N, Al, B, and Ti.
CONSTITUTION: A **steel** which has a composition containing, by weight, 0.05% C, <=0.05% N, and <=0.1% Al and satisfying relational inequalities, Al%/(N %-1.3)×B%-0.29×Ti%)>=10 and 1.3×B%/N%+0.29×Ti%/N%<1, is **hot-rolled** at a **temp**. no **lower** than the Ar<SB>3</SB> transformation point and **coiled** at >=65°C. Subsequently, at the time of subjecting the resulting **hot rolled plate** to pickling, to cold rolling, and to annealing, treatment is performed so that the time of stay (t) (sec) and the temp. T (K) in the temp. region of >=500°C satisfy an inequality. By this method, the cold rolled Al-killed **steel sheet** having **BH** characteristic and excellent in stretcher **strain** mark resistance can be obtained while obviating the necessity of overageing treatment.
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IC ICM C21D009-46
ICS C21D008-02
ICA C22C038-00; C22C038-14

L121 ANSWER 21 OF 24 JAPIO COPYRIGHT 2002 JPO
ACCESSION NUMBER: 1991-257123 JAPIO

TITLE: **PRODUCTION** OF **STEEL SHEET** FOR EXTREMELY THIN WELDED CAN HAVING EXCELLENT BLANK LAYOUT PROPERTY
INVENTOR: MARUOKA KUNIAKI; NOSAKA SHOJI; KONO TAKESHI; TANAKA SEIICHI
PATENT ASSIGNEE(S): NIPPON STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 03257123	A	19911115	Heisei	C21D009-46

APPLICATION INFORMATION
STN FORMAT: JP 1990-52642 19900306
ORIGINAL: JP02052642 Heisei
PRIORITY APPLN. INFO.: JP 1990-52642 19900306
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1991

AN 1991-257123 JAPIO
AB PURPOSE: To obtain the high-strength thin **steel sheet** having an excellent blank layout property by specifying a **cooling** temp., reheating temp., **hot rolling** finish temp., and secondary cold rolling draft at the time of **producing** the **steel sheet** for extremely thin welded cans from a slab consisting of a specific compsn.
CONSTITUTION: The slab contg., by weight%, over 0.0060% and 0.0300 or under C, <=0.06% Si, 0.05 to 0.60% Mn, <=0.06% P, <=0.06% S, 0.005 to 0.1005 Sol Al, and 0.0010 to 0.0100% N, and consisting of the balance iron and unavoidable impurities is **cooled** to an Ar<SB>3</SB> transformation point or below. The slab is then reheated to >=1050°C, more desirably >=1150°C and is finished by **hot rolling** at the temp. above the Ar<SB>3</SB> transformation point; thereafter, the **steel sheet** is **coiled** at about <=680°C. The **steel sheet** is further subjected to pickling, cold rolling and recrystallization annealing by conventional methods, then to secondary cold rolling at >=10% and <25% draft to **form** the **steel sheet** having <=0.15mm **thickness**, >=62 HR30-T **hardness**, and >=44kgf/mm<SP>2</SP> **tensile** strength in the rolling direction.
The **steel sheet** having the excellent blank layout property without being deteriorated in the ductility in the direction orthogonal with the rolling direction is obtd. in this way.

IC ICM C21D009-46
ICS C21D008-02
ICA C22C038-00; C22C038-14

L121 ANSWER 22 OF 24 JAPIO.
ACCESSION NUMBER: 1991-249133 JAPIO
TITLE: **PRODUCTION** OF **STEEL SHEET** FOR WELDED CAN EXCELLENT IN BLANK LAYOUT PROPERTY
INVENTOR: MARUOKA KUNIAKI; NOSAKA SHOJI; KONO TAKESHI; TANAKA SEIICHI
PATENT ASSIGNEE(S): NIPPON STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 03249133	A	19911107	Heisei	C21D009-46

APPLICATION INFORMATION
STN FORMAT: JP 1990-48205 19900228
ORIGINAL: JP02048205 Heisei
PRIORITY APPLN. INFO.: JP 1990-48205 19900228
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1991

AN 1991-249133 JAPIO
AB PURPOSE: To **produce** a **sheet** metal for welded cans free from deterioration in ductility in a rolling direction and excellent in strength characteristics by applying **hot rolling** to a low carbon **steel** slab under specific conditions and successively subjecting the resulting **hot rolled steel** plate to descaling, cold rolling, recrystallization annealing, and secondary cold rolling.
CONSTITUTION: A continuously cast slab or an ingoted and slabbed slab of a **steel** having a composition containing, by weight, >0.0060% C-<0.0600% C, <0.06% Si, 0.05-0.60% Mn, <0.06% P, <0.06% S, 0.005-0.100% acid soluble AC, and 0.0010-0.0100% N is **cooled** to a temp. not higher than the Ar<SB>3</SB> transformation point, reheated to >=1050°C, and **hot-rolled** at a finishing **temp**. not **lower** than the Ar<SB>3</SB> transformation point and at <=680°C **coiling** temp., or, **hot rolling** is started at >=900°C surface temp. while the continuously cast slab, etc., are in a high temp. stale after casting and **hot rolling** is carried out at a finishing **temp** . not **lower** than the Ar<SB>3</SB> transformation temp. and at <=680°C **coiling** temp. After the surface of the resulting **hot rolled steel** plate is descaled, this **steel** plate is subjected to cold rolling, to recrystallization annealing, and successively to secondary cold rolling at 2-10% reduction of area, by which the **sheet** metal for welded cans having <0.26mm **sheet thickness**, >=62 **hardness** HR<SB>30-</SB>T, and >=44kgf/mm<SP>2</SP> **tensile** strength in a rolling direction and excellent in blank layout property can be **produced**.

IC ICM C21D009-46
ICS C21D008-02
ICA C22C038-00; C22C038-06

L121 ANSWER 23 OF 24 JAPIO
ACCESSION NUMBER: 1988-247314 JAPIO
TITLE: **MANUFACTURE** OF **HOT-ROLLED** **SHEET** METAL HAVING DELAYED **AGEING** AT ORDINARY TEMPERATURE AND BAKING **HARDENABILITY**
INVENTOR: TOSAKA AKIO; MORITA MASAHIKO; HASHIGUCHI KOICHI; OKANO SHINOBU
PATENT ASSIGNEE(S): KAWASAKI STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 63247314	A	19881014	Showa	C21D009-46

APPLICATION INFORMATION
STN FORMAT: JP 1987-79570 19870402
ORIGINAL: JP62079570 Showa
PRIORITY APPLN. INFO.: JP 1987-79570 19870402
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1988

AN 1988-247314 JAPIO
AB PURPOSE: To easily **manufacture** a high-**tensile** **hot-rolled sheet** metal excellent in delayed **ageing** characteristic at ordinary temp. and baking **hardenability** and having superior workability, by subjecting a **steel** having a specific composition containing C, Mn, P, Al, and N to specific **hot rolling**, **cooling**, and **winding**.
CONSTITUTION: A **steel** containing, by weight, 0.02∼0.10% C, 0.5∼1.2% Mn, 0.04∼0.10% P, 0.02∼0.05% Al, and 0.005∼0.020% N is **hot-rolled** at a temp. of Ar<SB>3</SB>-20°C or above. Subsequently, the **hot rolled steel** **plate** is **cooled** at >=30°C/s average **cooling** rate so as to inhibit AlN precipitation and also to provide a fine ferritic structure. Then, **winding** is carried out at 150∼450°C so as to accelerate the proper precipitation of C. By this method, the high-**tensile** **hot-rolled** **sheet** metal showing baking **hardening** amount as high as >=about 5kgf/mm<SP>2</SP>, practically free from **age** deterioration at room temp., and having superior workability of about 40∼50kgf/mm<SP>2</SP> by T.S. can be obtained.

IC ICM C21D009-46
ICS B21B003-00
ICA C22C038-00; C22C038-06

L121 ANSWER 24 OF 24 JAPIO
ACCESSION NUMBER: 1979-088826 JAPIO
TITLE: **MANUFACTURE** OF COLD ROLLED **STEEL** **SHEET**
INVENTOR: KAWANAMI TAKAO; KASUGAI MAMORU; TAKEMOTO NAGAYASU; MIZUYAMA YAICHIRO
PATENT ASSIGNEE(S): NIPPON STEEL CORP
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 54088826	A	19790714	Showa	C21D009-48

APPLICATION INFORMATION
STN FORMAT: JP 1977-156957 19771226
ORIGINAL: JP52156957 Showa
PRIORITY APPLN. INFO.: JP 1977-156957 19771226
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1979
AN 1979-088826 JAPIO
AB PURPOSE: To **manufacture** a cold rolled **steel** **sheet** having good material characteristics value with good **productivity** by cold **rolling** a **hot** **rolled sheet** after carrying out descaling optionally; subjecting the cold **rolled sheet** to **heating**, soaking and slow **cooling** in a box annealing furnace; uncovering the furnace during the **cooling**; and applying tension to the **sheet** at a specific temp. to impart a **strain**.
CONSTITUTION: A **hot rolled sheet** is optionally descaled, cold rolled, and **coiled**. The **coil** is subjected to heating, soaking and slow **cooling** in a box annealing furnce. The furnace is uncovered at above 250°C during the **cooling**, and the **coil** is taken out and applied with tension at 500∼250°C to impart a **strain** of 0.1∼3.0

while being uncoiled. Since the **sheet** is slowly **cooled** to 500∼250°C, little dissolved carbon and nitrogen are contained in the **steel**, and the **sheet** is **hardly** affected by **strain aging** due to introduction of the **strain**. In addn., the effects of leveling the shape and eliminating **strain** figure are given, and the material characteristics value of annealed material is not deteriorated. Annealing time is reduced, so **productivity** is enhanced.
COPYRIGHT: (C)1979,JPO&Japio
IC ICM C21D009-48
ICS C21D001-32
ICA B21B001-22

=> file wpix

FILE 'WPIX' ENTERED AT 09:44:47 ON 30 OCT 2002
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=> d L133 1-9 max

L133 ANSWER 1 OF 9 WPIX (C) 2002 THOMSON DERWENT
AN 2002-150982 [20] WPIX
DNC C2002-047156
TI Band material for **coil** fastening comprises carbide precipitated **hardened hot rolled steel sheet** of specified **tensile** strength.
DC M24 M27
PA (KAWI) KAWASAKI STEEL CORP
CYC 1
PI JP 2001279375 A 20011010 (200220)* 4p C22C038-00
ADT JP 2001279375 A JP 2000-93645 20000330
PRAI JP 2000-93645 20000330
IC ICM C22C038-00
ICS C21D009-46; C22C038-14
AB JP2001279375 A UPAB: 20020402
NOVELTY - A band material comprises (in mass%) less than 0.15 carbon, less than silicon, less than 2 manganese, 0.04-0.15 niobium and/or titanium, less than 0.030 phosphorus, less than 0.010 sulfur with iron and removable impurities. The band material is a carbide precipitated **hardened hot rolled steel sheet** having **tensile** strength of 780 MPa.
DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for the **manufacture** of band material which involves **heating** steel slag at 1,200 deg. C and **hot rolling** at finishing temperature of Ar3 or more to **form** a **hot rolled steel sheet** having **thickness** of 1.5 mm. The **hot rolled** sheet is rapidly **cooled** and wound at 500-750 deg. C. A slit is provided on the sheet at preset **width**.
USE - Used for **coil** fastening.
ADVANTAGE - The band material excels in **coil** fastening property at **high temperature**. The **generation** of **winding** slack after **coil** fastening is prevented.
Dwg.0/0
TECH JP 2001279375 AUPTX: 20020402
TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Band Material: The band material has **tensile** strength of 780 MPa or more even after

reducing temperature to normal **temperature** after **coil** fastening at **high temperature**.
FS CPI
FA AB
MC CPI: M24-D01A; M24-D02D; M27-C02

L133 ANSWER 2 OF 9 WPIX (C) 2002 THOMSON DERWENT
AN 2000-467722 [41] WPIX
DNC C2000-141020
TI High **tensile** strength **hot-rolled** **steel sheet** used in interior materials for automobiles contains specified amounts of carbon, silicon, manganese, phosphorus, aluminum, nitrogen and the balance is iron.
DC M24 M27
IN FURUKIMI, O; KANEKO, S; SHIMIZU, T
PA (KAWI) KAWASAKI STEEL CORP; (KAWI) KAWASAKI SEITETSU KK
CYC 32
PI EP 1028167 A2 20000816 (200041)* EN 18p C21D008-02
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI
CA 2297291 A1 20000809 (200052) EN C22C038-06
CN 1263168 A 20000816 (200055) C22C038-04
JP 2000297350 A 20001024 (200059) 11p C22C038-00
BR 2000000325 A 20010123 (200108) C22C038-04
KR 2000057842 A 20000925 (200122) C21D008-00
TW 466276 A 20011201 (200252) C22C038-00
US 6425963 B1 20020730 (200254) C22C038-00
ADT EP 1028167 A2 EP 2000-101397 20000125; CA 2297291 A1 CA 2000-2297291 20000118; CN 1263168 A CN 2000-101872 20000204; JP 2000297350 A JP 2000-28141 20000204; BR 2000000325 A BR 2000-325 20000209; KR 2000057842 A KR 2000-4653 20000131; TW 466276 A TW 2000-101025 20000121; US 6425963 B1 US 2000-490267 20000124
PRAI JP 1999-31353 19990209
IC ICM C21D008-00; C21D008-02; C22C038-00; C22C038-04; C22C038-06
ICS B21B001-26; C21D009-46; C22C038-18; C22C038-58
AB EP 1028167 A UPAB: 20000831
NOVELTY - High **tensile** strength **hot-rolled** **steel sheet** comprises (wt.%): 0.01 - 0.12 carbon, 2.0 or less silicon, 0.01 - 3.0 manganese, 0.2 or less phosphorus, 0.001 - 0.1 aluminum, 0.003 - 0.02 nitrogen and the balance is iron and impurities.

DETAILED DESCRIPTION - The sheet has a structure comprising a **ferrite** of average grain diameter of 8 microns or less as a primary phase. The amount of solute nitrogen in the structure is 0.003 - 0.01 wt.% and the ratio, Ngb/Ng of an average concentration Ngb of nitrogen dissolved within a range of plus or minus 5 nm from the grain **ferrite** boundary to an average concentration Ng of nitrogen dissolved in **ferrite** grains is 100 - 10000.

An INDEPENDENT CLAIM is also included for a method of **manufacturing** the above **steel sheet** comprising:

(i) **heating** a steel material of the above composition to 1000 - 1300 deg. C;

(ii) rough-**rolling** the steel material;

(iii) finish-**rolling** the steel material with a reduction of a final stand of at least 10% at a finishing temperature FDT of (Ar3 + 100 deg. C) to (Ar3 + 10 deg. C);

(iv) **cooling** at a rate of 50 deg. C/s or more within 0.5 s after finish-**rolling**; and

(v) **coiling** at a **coiling** temperature of 600 - 350 deg. C.

USE - The **steel sheet** is used in interior materials for automobiles.
ADVANTAGE - The **steel sheet** has excellent bake **hardenability**, fatigue resistance, crash resistance, and resistance to room temperature aging (claimed).
Dwg.0/4
TECH EP 1028167 A2 UPTX: 20000831
TECHNOLOGY FOCUS - METALLURGY - Preferred Materials: The **steel sheet** further comprises (wt.%): 0.001 - 0.1 titanium, 0.001 - 0.1 niobium and/or at least one element selected from 0.1 - 1.5 nickel, 0.1 - 1.5 chromium and 0.1 - 1.5 molybdenum. The **ferrite** average grain diameter is less than 6 microns and the amount of nitrogen is 0.005 - 0.01 wt.%. The structure comprises at least one of the following: pearlite, bainite, **martensite** and retained austenite as a secondary phase. A **plated** layer is **formed** on the surface of the **hot-rolled steel sheet**.
Preferred Method: The **steel** material is **heated** at 1070 - 1180degreesC.
FS CPI
FA AB
MC CPI: M24-D01A; M27-A04; M27-A04M; M27-A04N; M27-A04X

L133 ANSWER 3 OF 9 WPIX (C) 2002 THOMSON DERWENT
AN 1994-189303 [23] WPIX
DNC C1994-086678
TI **Hot rolled steel sheet mfr**
. having excellent fatigue characteristics - by reheating steel slab comprising carbon, silicon , manganese , phosphorous , aluminium.
DC M21 M24 M27
PA (SUMQ) SUMITOMO METAL IND LTD
CYC 1
PI JP 06128688 A 19940510 (199423)* 6p C22C038-00
ADT JP 06128688 A JP 1992-306245 19921020
PRAI JP 1992-306245 19921020
IC C21D008-02; C21D009-48; C22C038-38
AB JP 06128688 A UPAB: 19940727
The **steel sheet** is **made** by reheating a steel slab comprising (by wt.) 0.02-0.08% C, 1.5-2.5% Si, 0.5-2.0% Mn, 0.005-0.06% P, 0.01-0.10% Al, up to 0.015% S, 0.2-1.0% Cr, and/or 0.02-1.0% Mo, up to 0.1% Nb and/or Ti, and balance Fe and incidental impurities to temps. at least 1000 deg.C, or by casting the steel melt into a steel slab, and just after the casting, **hot rolling** it to terminate it at temps. of the final pass exit side of at least (Ar3-50 deg.C), **cooling** it to 400-600 deg.C with a **cooling** rate of 1-50 deg.C/sec., **winding** the **hot rolled steel sheet**, to have a composite metal structure comprising 5-15 vol.% **martensite**, and balance substantially **ferrite**, the ratio of Vickers **hardness** of **ferrite** (HV)/**tensile** strength of **hot rolled steel sheet** (MPa) of at least 0.27, excellent fatigue characteristics, and **tensile** strength of 500-800 MPa.
USE - Used for car wheels, being submitted to repeating load.
Dwg.0/2
FS CPI
FA AB; GI
MC CPI: M24-D01A; M27-B04; M27-B04A; M27-B04C; M27-B04M; M27-B04P; M27-B04S

L133 ANSWER 4 OF 9 WPIX (C) 2002 THOMSON DERWENT
AN 1992-233818 [28] WPIX

DNC C1992-105412
TI Mfg. bake-**hardening**, cold-**rolled steel** **sheet** with dual phase structure - having good dent resistance, high **tensile** strength and ductility together with low yield ratio for automobile panels.
DC M24 M27
IN CHOU, T S
PA (CHST-N) CHINA STEEL CORP LTD
CYC 1
PI US 5123969 A 19920623 (199228)* 12p C21D008-00
ADT US 5123969 A US 1991-648937 19910201
PRAI US 1991-648937 19910201
IC ICM C21D008-00
AB US 5123969 A UPAB: 19931006
Bake-**hardening**, dual-phase, cold-**rolled steel** **sheet** is mfd. by; (a) **prepg**. a melt comprising (wt.%): 0.02-0.06 C, 0.6-1.4 Mn, up to 0.5 Si, up to 0.1 P, up to 0.1 Al, up to 0.01 nitrogen, up to 0.1 Ti and up to 50 ppm B, (b) continuous casting the melt to **form** steel ingots, (c) **hot rolling** the ingots to **form hot rolled** bands, (d) **coiling** the bands at 560-720 deg.C, (e) cold **rolling** and soaking the sheets at 780-900 deg.C for less than 5 mins. to effect an intercritical **ferrite** plus austenite dual-phase structure, (f) gradually **cooling** the sheet in air to a temp. of 650-750 deg.C, and (g) further **cooling** the sheets to 200-400 deg.C by **roller-quenching** at a **cooling** rate of 50-400 deg.C per sec. to effect overaging for 1-6 mins whereby a **ferrite** plus **martensite** dual-phase structure is effected.
USE/ADVANTAGE - The sheet has good bake and work **hardenability** and good dent resistance, high **tensile** strength and ductility and a low yield ratio, and is suitable for the outer panel of an automobile.
0/5
FS CPI
FA AB
MC CPI: M22-G02; M24-D01A; M24-D01B; M24-D02B; M24-D04; M27-A01; M27-A04; M27-A04M

L133 ANSWER 5 OF 9 WPIX (C) 2002 THOMSON DERWENT
AN 1992-119984 [15] WPIX
DNN N1992-089723 DNC C1992-055797
TI Car body stiffening steel pipe **prodn**. - using pipe defined by its **thickness** dia and bending span.
DC M27 Q12
IN TANABE, H; YAMAZAKI, K
PA (YAWA) NIPPON STEEL CORP
CYC 3
PI JP 04063242 A 19920228 (199215)* 7p
US 5181974 A 19930126 (199307)# 14p C22C038-04
US 5192376 A 19930309 (199312)# 14p C21D008-10
CA 2056212 A 19930527 (199333)# F16L009-02
CA 2056212 C 19960716 (199639)# F16L009-02
JP 2811226 B2 19981015 (199846) 8p B60J005-00
ADT JP 04063242 A JP 1990-175114 19900702; US 5181974 A US 1991-796768 19911125; US 5192376 A Div ex US 1991-796768 19911125, US 1992-887439 19920521; CA 2056212 A CA 1991-2056212 19911126; CA 2056212 C CA 1991-2056212 19911126; JP 2811226 B2 JP 1990-175114 19900702
FDT JP 2811226 B2 Previous Publ. JP 04063242
PRAI JP 1990-175114 19900702
IC ICM B60J005-00; C21D008-10; C22C038-04; F16L009-02

ICS B60J005-04; B60R019-04; B62D029-00; C22C038-00; C22C038-14
AB JP 04063242 A UPAB: 19931006
The specification of the steel pipe is determined by the formula: t/D (mm/mm) is composed of 0.16-6.0 x 10 power -5 x L is at least t/D and t/D is up to 0.09 - 4.8 x 10 power -3 x L wherein; L = bending span of the pipe. t = **thickness** of the pipe. D = dia. of the pipe.
USE/ADVANTAGE - Used for **mfr.** of stiffening steel pipes for car body. This size can absorbe efficiently the collision energy of the car.
0/3
ABEQ US 5181974 A UPAB: 19931006
Automobile body reinforcing steel pipe has a wall **thickness**: outer dia ratio, t/D of formula t/C = 0.16-6.0 x 10 power (-5)L - 0.09-4.8 x 10 power (-5)L, where L (mm) is a span of bending load applied to the pipe. Pref. steel pipe has a **tensile** strength of 120 kgf/mm2 or more and an elongation of 10% or more. Pref. steel consists of 0.15-0.25 wt.% C, 1.8 wt.% Mn, 0.5 wt.% Si, 0.04 wt.% Ti, 0.0003-0.0035 wt.% B with the remainder being Fe and impurities including 0.0080 wt.% Ni.
USE/ADVANTAGE - Automobile body reinforcing pipe e.g. impact beam has high bending and **tensile** strength under large scale deformation, to absorb car collision energy before large scale deformation occurs, and provides lightweight car body without redn. of energy absorbing ability.
0/6
ABEQ US 5192376 A UPAB: 19931006
Prodn. of automobile body reinforcing steel pipe with wall **thickness**-to-outer dia. ratio t/D of formula t/D=0.09-0.48 x 10 power (-5) x L-0.16-6.0 x 10 power (-5) x L (I) comprises (i) **hot rolling** to **form steel sheet** from **steel** contg. 0.15-0.25 wt.% C, 1.8 wt.% Mn, 0.5 wt.% Si, 0.04 wt.% Ti, 0.0003-0.0035 wt.% B with the remainder being Fe and impurities and including 0.0080 wt.% Ni, (ii) **coiling** the **steel sheet** in an as-**hot rolled** state at 600 deg.C or higher, (iii) **roll forming** the **steel sheet** to pipe shape having adjacent edges and (iv) electric welding the pipe shape at adjacent edges to **form** an electric welded steel pipe, and **quench hardening** the steel pipe. In (I) L(mm) is a span of a bending load applied to the pipe.
USE/ADVANTAGE - Provides automobile body reinforcing steel pipe e.g. impact beam which exhibits high bending and **tensile** strength under large deformation to absorb collision energy.
0/0
FS CPI GMPI
FA AB
MC CPI: M27-A04

L133 ANSWER 6 OF 9 WPIX (C) 2002 THOMSON DERWENT
AN 1989-023860 [03] WPIX
DNC C1989-010719
TI High strength cold-**rolled steel sheet** **prodn.** - has reduced copper content recrystallised ferritic single phase obtd. by pptn. of copper from solid soln. to give high gamma value.
DC M24 M27
IN AKISUE, O; KISHIDA, K
PA (YAWA) NIPPON STEEL CORP
CYC 5
PI WO 8810319 A 19881229 (198903)* JA 29p
RW: DE FR GB US
W: US
JP 01004429 A 19890109 (198907)
EP 319590 A 19890614 (198924) EN

R: DE FR GB
JP 02015609 B 19900412 (199019)
US 4961793 A 19901009 (199043)
EP 319590 B1 19930414 (199315) EN 16p C22C038-16
R: DE FR GB
DE 3880276 G 19930519 (199321) C22C038-16
ADT WO 8810319 A WO 1988-JP640 19880627; JP 01004429 A JP 1987-157892 19870626; EP 319590 A EP 1988-906042 19880627; JP 02015609 B JP 1987-157892 19870626; US 4961793 A US 1988-320268 19881118; EP 319590 B1 EP 1988-906042 19880627, WO 1988-JP640 19880627; DE 3880276 G DE 1988-3880276 19880627, EP 1988-906042 19880627, WO 1988-JP640 19880627
FDT EP 319590 B1 Based on WO 8810319; DE 3880276 G Based on EP 319590, Based on WO 8810319
PRAI JP 1987-157892 19870626
REP JP 59076824; JP 59076825; JP 61015948; BE 831561; FR 2311096; GB 982448; US 2986483; US 3368886; US 3917494
IC ICM C22C038-16
ICS C21D008-04; C21D009-56
AB WO 8810319 A UPAB: 19930923
This improved high-strength cold-**rolled steel sheet** comprises C (0.010% or less), Mn (0.05-0.5%), Si (1.0% or less), S (0.001-0.30%), P (0.03% or less), N (0.0050% or less), Sol Al (0.005-0.10%), Cu (0.8-2.2%), Fe and unavoidable impurities (the residual). Ni (0.15-0.2%) and/or B (0.001-0.0030%) can be added as components. Ti (0.01-0.2%) and/or Nb (0.005-0.20%) can also be added to the above compsn. The cold-**rolled steel sheet** is composed mainly of recrystallised ferritic single phase and is specified to have a high gamma-value. The cold-**rolled** steel is **produced** by the following process: (i) steel having the above-mentioned compsn. is **hot-rolled** at the Ar3 **temp**. or **higher**, (ii) the obtd. **hot-rolled** steel is wound at a temp. of 450 deg.C or less into a **coil**, (iii) the wound **coil** is cold-**rolled**, (iv) the obtd. cold-**rolled steel sheet** is recrystallising-annealed at a temp. of 750 deg.C or higher, and (v) the obtd. annealed **steel sheet** is **heat**-treated at a temp. between 450 and 700 deg.C for 1 min. or longer. Step (v) can be replaced by a step (vi) in which the obtd. annealed **steel sheet** is **cooled** to a **temp. lower** than 450 deg.C within 1 min., and is then moulded and **heat**-treated (at 450 deg.C or higher).
USE/ADVANTAGE - This process enables a high-strength cold-**rolled steel sheet** having a high gamma-value to be **produced** efficiently by a continuous annealing process. The steel has an extension strength of 45-75 kg/mm2.
0/0
ABEQ EP 319590 B UPAB: 19930923
A high-strength cold-**rolled steel sheet** having a high r value characterised by comprising 0.010% or less of carbon, 0.05 to 0.5% of manganese, 1.0% or less of silicon, 0.001 to 0.030% of sulphur, 0.03% or less of phosphorus, 0.0050% or less of nitrogen, 0.005 to 0.10% of sol. aluminium, and 0.8 to 2.2% of copper and optionally 0.01-0.2% titanium, 0.005-0.2 niobium, 0.15-0.45% nickel, and/or 0.0001-0.0030% boron, with the balance being iron and unavoidable elements and substantially comprising a recrystallised ferritic single phase structure.
0/4
ABEQ US 4961793 A UPAB: 19930923
A cold-**rolled steel sheet hardenable** by **heat**-treatment and with a high r value contains (%) up to

0.01C, 0.05-0.5 Mn, up to 1.0 Si, 0.001-0.03 S, up to 0.03 P, up to 0.005 N, 0.005-0.1 of soluble aluminium, 1-2.2 Cu, balance Fe. The material comprising a recrystallised ferritic single phase structure.

ADVANTAGE - High strength cold **rolled steel sheet** can be **produced** with a high r value and a **tensile** strength of 45-75 kgf/sq mm since the sheet requires relatively few **heat** treatment stages costs are reduced.

FS CPI
FA AB
MC CPI: M27-A04; M27-A04A; M27-A04C; M27-A04M; M27-A04P; M27-A04S

L133 ANSWER 7 OF 9 WPIX (C) 2002 THOMSON DERWENT
AN 1982-91663E [43] WPIX
TI **Ferrite-martensite** high **tensile hot -rolled steel sheet prodn.** - by **hot-rolling** and **coiling** steel contg. aluminium, chromium, nickel, copper, molybdenum and opt. boron.
DC M24 M27
PA (KAWI) KAWASAKI STEEL CORP
CYC 1
PI JP 57152421 A 19820920 (198243)* 13p
PRAI JP 1981-37281 19810317
IC C21D008-02
AB JP 57152421 A UPAB: 19930915

When a steel comprising 0.02-0.20% C, up to 1.50% Si, 0.50-2.00% Mn, up to 0.100% P, up to 0.010% S, 0.01-0.10% sol. Al, 0-1.00% Cr, 0-0.50% Ni, 0-0.50% Cu, 0-0.20% Mo, opt. 0.0006-0.010% B, balance Fe and impurities is **rolled** in a conventional strip mill, finish **hot-rolling** is completed at a **temp. higher** than Ar3 -50 deg.C and then **coiled** in the range of Tc (deg.C) to Ar3 where

Tc(deg.C)=727-23x(Mn%-Si%-0.78Cr% +0.87Ni% +0.15Cu%-0.87(Mo%) power1/2

The sheet is maintained **coiled** in the same temp. range for a period of t(min) where t(min)= 5-150. The sheet is then recoiled and continuously **cooled** from a **temp. higher** than Tq (deg.C), defined by

Tq(deg.C)= Tc+71 og.t/150

to a temp. below 300 deg.C at a speed higher than an av. **cooling** speed Cr (deg.C/sec.) defined by logCr= -1.58Y+3.65.

(Y= Mn%+1.3Cr%+3.0Mo%+ 2.0P+0.5(Ni%+Cu%) +0.1Si% in case when B is up to 0.0005%

or Y= Mn%+1.3Cr%+3.0Mo% +2.0P%+0.5(Ni%+Cu%) +0.1Si%+2.0 in case of when B is at least 0.0006%

The steel may further contain 0.01-0.10%, in total, of one or more of Nb, V and Ti.

Steel sheet, having a composite structure of a martensitic sec. phase is dispersed in a ferritic matrix, has a low yield ratio, good ductility and a good work-**hardenability**. The dual phase **steel sheet** can be **produced** at a low cost by **coiling** and holding it at a **high temp** . in a **ferrite**-austenite zone.

FS CPI
FA AB
MC CPI: M24-D01A; M27-A01; M27-A04

L133 ANSWER 8 OF 9 WPIX (C) 2002 THOMSON DERWENT
AN 1982-62454E [30] WPIX
TI High strength cold **rolled steel sheet** - has controlled relationship between silicon, phosphorus, and manganese

contents and is bell furnace annealed after **rolling**.
DC M24 M27
PA (KAWI) KAWASAKI STEEL CORP
CYC 1
PI JP 57098630 A 19820618 (198230)* 6p
JP 63023248 B 19880516 (198823)
ADT JP 57098630 A JP 1980-172776 19801208
PRAI JP 1980-172776 19801208
IC C21D008-04; C21D009-48; C22C038-06
AB JP 57098630 A UPAB: 19930915
Prodn. is described of a high strength cold-**rolled** **steel plate** provided with high r value and **hardenability** . The steel consisting by wt. of below 0.06%,Si 0.3-1.8%, Mn 0.1-1.0%, P. 0.04-0.20%, acid soluble Al 0.01-0.20%, and with (Si+4P)/Mn= 1-13, and the balance Fe with incidental impurities. It is **hot-rolled** , cold-**rolled**, annealed for a short time at within 650-900 deg.C on a continuous annealing line. The **cooled coil** is subjected to final annealing treatment by **heating** to 250-500 deg.C for 0.5-10 hours in a bell type annealing furnace.
This provides a sheet used for light weight automobile parts of **tensile** strength more than 50 Kg/mm2, workability of r value more than 1.3 and seizing workability (sic) more than 2 kg/mm2. The C content is reduced pref. to 0.01-0.03% and temper colour is eliminated by the use of a continuous annealing process.
FS CPI
FA AB
MC CPI: M27-A01; M27-A04; M27-B04

L133 ANSWER 9 OF 9 WPIX (C) 2002 THOMSON DERWENT
AN 1981-29103D [17] WPIX
TI Two-phase **steel sheet** with excellent formability - **cooled** from continuous annealing **temp**. at **low** initial and high final **cooling** rates.
DC M24 P51
PA (YAWA) NIPPON STEEL CORP
CYC 11
PI BE 886583 A 19810401 (198117)*
BR 8008153 A 19810630 (198130)
NL 8006798 A 19810716 (198132)
SE 8008717 A 19810720 (198132)
FR 2472022 A 19810626 (198133)
JP 56087626 A 19810716 (198135)
GB 2070058 A 19810903 (198136)
DE 3046941 A 19811001 (198141)
CA 1139644 A 19830118 (198308)
GB 2070058 B 19830602 (198322)
US 4394186 A 19830719 (198331)
JP 58050300 B 19831109 (198348)
DE 3046941 C 19840426 (198418)
IT 1129435 B 19860604 (198744)
NL 184480 B 19890301 (198912)
ADT NL 8006798 A NL 1980-6798 19801215; DE 3046941 A DE 1980-3046941 19801212
PRAI JP 1979-163277 19791215
IC B21C000-00; C21D001-19; C21D008-02; C21D009-46; C22C038-04; C22F000-00
AB BE 886583 A UPAB: 19930915
A two phase **steel sheet**, consisting of **ferrite** phis at least one of **martensite**, bainite and retained austenite, is **produced** by (a) **hot rolling** a steel contg. 0.01-0.12% C and 0.7-1.7% Mn, and then **coiling**; (b) continuously annealing at 730-900 deg. C; (c) **cooling** from the

annealing temp. to an intermediate temp. (T) of 420-700 deg.C at an average **cooling** rate (R') of 1-30 deg.C/sec.; and (d) **cooling** from temp. T to a temp. of not greater than 200 deg.C at an average **cooling** rate (R") of 100-300 deg.C/sec.

The **steel sheet** can be used for automobile bodywork and has a **tensile** strength of up to 40 kg/sq.mm, excellent formability and high artificial age **hardenability** after **forming**. The process is compatible with **hot** dip coating processes, e.g. **hot** dip galvanising can be carried out between steps (c) and (d).

ABEQ DE 3046941 C UPAB: 19930915

Steel sheet with two-phase structure principally of **ferrite** with at least one further phase from gp. **martensite**, bainite, and residual austenite is **produced** by process which gives improved mechanical properties. Steel, contg. 0.01-0.12% C and 0.7-1.7% Mn, remainder Fe and impurities, is **hot -rolled**, **coiled**, and then annealed at temp. between 730 and 900 deg.C. It is **cooled** from this temp. at an average rate of 1-30 C deg./sec in a first **cooling** step to temp. in the range 420-700 deg.C and at an average rate of 100-300 C deg/sec. in a second step from the intermediate temp. to a temp. not more than 200 deg.C.

Steel has strength of 392-491 N/mm2 and a yield pt. ratio of less than 0.6, giving good deformability and high ageing **hardenability** after **forming**.

FS CPI GMPI
FA AB
MC CPI: M24-D02

=> d L134 ti 1-13

L134 ANSWER 1 OF 13 WPIX (C) 2002 THOMSON DERWENT
TI Cold **rolled steel sheet** for composite moldings for vehicle panel, contains preset amount of nitrogen, niobium, titanium, phosphorus, sulfur, sol.aluminum, carbon, silicon, manganese and satisfies preset condition.

L134 ANSWER 2 OF 13 WPIX (C) 2002 THOMSON DERWENT
TI Cold **rolled steel sheet** for composite moldings for vehicle panel, contains preset amount of nitrogen, niobium, titanium, phosphorus, sulfur, sol.aluminum, carbon, silicon, manganese and satisfies preset condition.

L134 ANSWER 3 OF 13 WPIX (C) 2002 THOMSON DERWENT
TI Automobile bumper **manufacture** - by feeding **steel sheet** onto conveyor system, feeding **steel sheet** through **roll** mill, **hardening** sheet, and cutting into specified lengths to bumper beams.

L134 ANSWER 4 OF 13 WPIX (C) 2002 THOMSON DERWENT
TI Formable high strength cold **rolled steel sheet** - obtd. by finishing **hot rolling** slab **winding** at room temp. to 750 deg. C, cold **rolling** with at least 60% redn. ratio and in-line annealing galvanising.

L134 ANSWER 5 OF 13 WPIX (C) 2002 THOMSON DERWENT
TI **Steel sheet** with good strength, workability and weldability - **hot rolled** from slab of specific composition, esp. for motor industry use.

L134 ANSWER 6 OF 13 WPIX (C) 2002 THOMSON DERWENT
TI **Mfr**. of high strength galvannealed **sheet steel** with good formability - from steel contg. carbon, silicon, manganese , phosphorus, sulphur, acid soluble aluminium., nitrogen, niobium, titanium , boron and iron.

L134 ANSWER 7 OF 13 WPIX (C) 2002 THOMSON DERWENT
TI **Heat** treatment cycle for low carbon, aluminium killed **steel sheet** - by cold **rolling** and galvanising involving **heating** above recrystallisation **temp**. and **redn**. in **reducing** atmos..

L134 ANSWER 8 OF 13 WPIX (C) 2002 THOMSON DERWENT
TI Continuously annealed **steel sheet** - useful for drawn and ironed can **mfr**..

L134 ANSWER 9 OF 13 WPIX (C) 2002 THOMSON DERWENT
TI Continuously annealed **steel sheet** for motor vehicle body - contg. related amts. of nitrogen and phosphorous for good press-**forming** and bake-**hardening** properties.

L134 ANSWER 10 OF 13 WPIX (C) 2002 THOMSON DERWENT
TI Age **hardenable** steel with good paint baking properties - has phosphorus content related to carbon content and is given specified box annealing treatment.

L134 ANSWER 11 OF 13 WPIX (C) 2002 THOMSON DERWENT
TI Paint curable galvanised **steel sheet** - includes small amts. of vanadium and/or niobium and is **cooled** at predetermined rate after galvanising.

L134 ANSWER 12 OF 13 WPIX (C) 2002 THOMSON DERWENT
TI High strength cold **rolled steel sheet** for vehicle bodywork panels - has specified combined total of carbon and phosphorus, is free of silicon, and is **heat** treated.

L134 ANSWER 13 OF 13 WPIX (C) 2002 THOMSON DERWENT
TI High **tensile** profiles **made** from **steel sheet** or strip - which is over-aged during **cooling** after **hot rolling**, cold **formed**, solution **heat** treated and **cooled** to obtd. pptd. phase.

=> d L134 4,5,6,8,13,1-3,7,9-12 max

L134 ANSWER 4 OF 13 WPIX (C) 2002 THOMSON DERWENT
AN 1993-357490 [45] WPIX
DNC C1993-158609
TI Formable high strength cold **rolled steel sheet** - obtd. by finishing **hot rolling** slab **winding** at room temp. to 750 deg. C, cold **rolling** with at least 60% redn. ratio and in-line annealing galvanising.
DC M13 M24 M27
PA (YAWA) NIPPON STEEL CORP
CYC 1
PI JP 05263188 A 19931012 (199345)* 9p C22C038-00
ADT JP 05263188 A JP 1992-60451 19920317
PRAI JP 1992-60451 19920317
IC C21D008-04; C21D009-48; C22C038-14; C23C002-06; C23C002-40

AB JP 05263188 A UPAB: 19931220
The **steel sheet** is **made** by finishing **hot rolling** a slab comprising (by wt.) 0.0003-0.01% C, up to 0.8% Si, over 0.45-under 1.5% Mn, under 0.04% P, 0.0005-0.015% S, 0.005-0.1% Al, 0.0003-0.0060% N, 0.003-0.1% Ti, and balance Fe and incidental impurities at (Ar3-100) deg.C; **winding** at room temp. to 750 deg.C; cold **rolling** with at least 60% redn. ratio, and in-line annealing type galvanising it with annealing temps. of 700-900 deg.C.
USE - For car panels, having high work-**hardenability** at low **strain** range, and high bake-**hardenability**.
Dwg.0/1
FS CPI
FA AB
MC CPI: M13-A; M27-B04; M27-B04A; M27-B04M; M27-B04S; M27-B04T; M27-B04X

L134 ANSWER 5 OF 13 WPIX (C) 2002 THOMSON DERWENT
AN 1993-313643 [40] WPIX
DNC C1993-139307
TI **Steel sheet** with good strength, workability and weldability - **hot rolled** from slab of specific composition, esp. for motor industry use.
DC M27
IN BANO, X; CORQUILLET, J; MARTEAU, C
PA (SOLL-N) SOLLAC SA
CYC 4
PI EP 564309 A1 19931006 (199340)* FR 5p C22C038-04
FR 2688009 A1 19930903 (199346) 14p C22C038-04
EP 564309 B1 19960605 (199627) FR 6p C22C038-04
R: DE FR GB IT
DE 69302950 E 19960711 (199633) C22C038-04
ADT EP 564309 A1 EP 1993-400287 19930204; FR 2688009 A1 FR 1992-2407 19920228; EP 564309 B1 EP 1993-400287 19930204; DE 69302950 E DE 1993-602950 19930204, EP 1993-400287 19930204
FDT DE 69302950 E Based on EP 564309
PRAI FR 1992-2407 19920228
REP EP 80809; FR 2000542; GB 2019439
IC ICM C22C038-04
ICS B21B001-42; B21C047-02; C21D008-02
AB EP 564309 A UPAB: 19931129
Steel sheet is **produced** by **hot rolling** a slab having a composition in wt.% of:- less than 0.05 C; 1.5-2 Mn; 0.1-0.5 Si; 0.2-0.5 Mo; less than 0.03 P; less than 0.01 S; 0.04-0.06 Nb; 0.02-0.05 Ti; 0.01-0.06 Al; 10-40 ppm B; with the nitrogen and titanium satisfying the relationship 3.5 N is at most equal to Ti; balance Fe and impurities.
The slab is **hot rolled** in a wide **rolling** train with a reduction in the finishing **roll** of 70-95% and a final temp. of 800-900 deg.C. The sheet is water and air **cooled** at a speed of 50-150 deg.C/sec. into the austenite range and then **coiled** at 500-600 deg.C.
USE/ADVANTAGE - Esp. in the motor industry.
Sheet has good yield (620-720 MPa) and **tensile** strength (800-900 MPa) with ratio of yield/**tensile** between 0.7-0.82. Can be easily worked and has good weldability.
Dwg. 0/0
ABEQ FR 2688009 A UPAB: 19940103
Prodn. comprises **hot rolling** a slab in a wide **rolling** train with a redn. in the finishing **roll** of 70-95% and a final temp. of 800-900 deg.C. The sheet is water and air

cooled at a speed of 50-150 deg.C/sec. into the austenite range and then **coiled** at 500-600 deg.C. The slab has a compsn. (wt.%) of less than 0.05 C; 1.5-2 Mn; 0.1-0.5 Si; 0.2-0.5 Mo; less than 0.03 P; less than 0.01 S; 0.04-0.06 Nb; 0.02-0.05 Ti; 0.01-0.06 Al; 10-40 ppm B; (with the N and Ti satisfying the relationship where 3.5 N is at most equal to Ti) and balance Fe and impurities.

USE/ADVANTAGE - Used esp. in the motor industry. Sheet has good yield (620-720 MPa) and **tensile** strength (800-900 MPa) with ratio of yield/**tensile** between 0.7-0.82. Can be easily worked and has good weldability.

Dwg.0/0

ABEQ EP 564309 B UPAB: 19960710

A process for **producing** a **sheet** from a **steel** slab, characterised in that a steel is used which has the following composition by weight, carbon less than 0.05%, manganese from 1.5 to 2%, silicon from 0.1 to 0.5%, molybdenum from 0.2 to 0.5%, phosphorus less than 0.03%, sulphur less than 0.01%, niobium from 0.04 to 0.06%, titanium from 0.02 to 0.05%, aluminium from 0.01 to 0.06%, boron from 10 to 40 ppm., the nitrogen and titanium contents satisfying the expression 3.5 N at most Ti, the remainder being iron and impurities, the steel slab is **hot-rolled** in a wide-strip **rolling** mil train, with a work-**hardening** coefficient of from 70 to 95% in a finishing mill train such that when the **rolling** is completed a **steel sheet** is obtained with a temperature of from 800 to 900 deg.C., the sheet is air-and water-**cooled** at a **cooling** rate of from 50 to 150 deg.C./second in the austenitic range, and the **cooled** sheet is **coiled** at a temperature of from 500 to 600 deg.C..

Dwg.0/0

FS CPI

FA AB

MC CPI: M24-D01A; M27-B04; M27-B04A; M27-B04B; M27-B04M; M27-B04N; M27-B04S; M27-B04T

L134 ANSWER 6 OF 13 WPIX (C) 2002 THOMSON DERWENT

AN 1993-062054 [08] WPIX

DNC C1993-028205

TI **Mfr**. of high strength galvannealed **sheet steel** with good formability - from steel contg. carbon, silicon, manganese , phosphorus, sulphur, acid soluble aluminium., nitrogen, niobium, titanium , boron and iron.

DC M13 M27

PA (YAWA) NIPPON STEEL CORP

CYC 1

PI JP 05009698 A 19930119 (199308)* 7p C23C002-28

ADT JP 05009698 A JP 1991-193655 19910709

PRAI JP 1991-193655 19910709

IC ICM C23C002-28

ICS C21D008-02; C22C038-14; C23C002-06; C23C002-40

AB JP 05009698 A UPAB: 19930924

The steel is **made** by **making** a steel comprising (by wt.) up to 0.004% C, over 0.4-1.5% Si, over 0.4-2.5% Mn, up to 0.10% P, up to 0.015% S, 0.005-0.10% acid soluble al, up to 0.004% N, up to 0.05% Nb, but 0-0.025% Nb-93/12C, 0.008-0.020% Ti, 0.0001-0.0020% B, and balance Fe and incidental impurities into a slab, **winding** the **hot rolled** sheet at temps. of at least 600 deg. C cold **rolling** the obtd. sheet, regulating oxidn. balance whilst **heating** so that the concentration amt. of Si up to 300 Angstroms of the surface layer of the sheet to be up to 1.5 mg/m2, **heating** it to 800-950 deg. C **cooling** it, followed by galvanising and galvannealing.

USE - Used for high strength galvannealed **sheet steel** for outer **sheet** of cars, having at least 35 kgf/mm2 **tensile** strength, with good workability, and paint baking **hardenability**.
0/0
FS CPI
FA AB
MC CPI: M13-A; M27-B04; M27-B04A; M27-B04B; M27-B04M; M27-B04N; M27-B04S; M27-B04T

L134 ANSWER 8 OF 13 WPIX (C) 2002 THOMSON DERWENT
AN 1988-205630 [30] WPIX
DNC C1988-091788
TI Continuously annealed **steel sheet** - useful for drawn and ironed can **mfr**..
DC M24
PA (YAWA) NIPPON STEEL CORP
CYC 4
PI AU 8781605 A 19880602 (198830)* 33p
NO 8704886 A 19880620 (198830)
JP 63134645 A 19880607 (198831)
ES 2008353 A 19890716 (198948)
ADT AU 8781605 A AU 1987-81605 19871123; ES 2008353 A ES 1987-3381 19871126
PRAI JP 1986-279761 19861126
IC C22C038-06
AB AU 8781605 A UPAB: 19930923
(A) A continuously annealed **steel sheet**, having excellent stretching flange formability and suitable for **prodn**. of drawn and ironed cans, has the compsn. 0.004-0.060% C, 0.05-0.60% Mn, max. 0.020% P, 0.05-0.100% acid-soluble Al, max. 0.007% N, balance Fe and impurities and has a **tensile** strength of max. 42 kgf/sq.mm. and a JIS grain size number of 8.5-11.5.
(B) **Prodn**. of the **steel sheet** involves **hot rolling** a low carbon Al-killed steel slab of compsn. given in (A), **coiling** the resulting strip at 600-710 deg. C, cold **rolling**, recrystallisation annealing at max. 850 deg. C for 5 secs. to 3 mins., **cooling** at 5-250 deg. C/sec. and overaging at 300-500 deg. C for 30-180 secs.
ADVANTAGE - The process allows use of continuous annealing and give a sheet **product** with T-1 to T-3 temper, the sheet being **hardenable** during paint baking after drawing and ironing to give high pressure resistance.
0/4
FS CPI
FA AB
MC CPI: M24-D02B; M24-D02D; M27-B04A; M27-B04M

L134 ANSWER 13 OF 13 WPIX (C) 2002 THOMSON DERWENT
AN 1980-48341C [28] WPIX
TI High **tensile** profiles **made** from **steel sheet** or strip - which is over-aged during **cooling** after **hot rolling**, cold **formed**, solution **heat** treated and **cooled** to obtd. pptd. phase.
DC M24
IN GROSS, H; REITH, F; RETZLAFF, F
PA (HOES) HOESCH WERKE AG
CYC 13
PI DE 2900022 A 19800703 (198028)*
EP 13331 A 19800723 (198031) DE
R: BE FR GB IT LU SE

JP 55091941 A 19800711 (198034)
NO 7904340 A 19800728 (198034)
DE 2900022 B 19810226 (198110)
CA 1125150 A 19820608 (198226)
EP 13331 B 19820915 (198238) DE
R: BE FR GB IT LU SE
RO 80871 A 19821130 (198333)
US 4414042 A 19831108 (198347)
SU 1087078 A 19840415 (198449)
US 4732623 A 19880322 (198815)
PRAI DE 1979-2900022 19790102
REP DD 54709; DE 1184509; DE 1234995; DE 1936589; DE 2033002; DE 2120618; DE 2133744; DE 2219456; DE 2365156; DE 2440176; DE 2657435; US 3849209
IC C21D001-78; C21D006-02; C21D007-14; C21D008-02; C21D009-46
AB DE 2900022 A UPAB: 19930902
High **tensile steel** profiles **made** from **sheet** or strip. The profiles have yield point of >=500N/mm2, **tensile** strength of >=600N/mm2, and high toughness. A fine-grained, pptn.-**hardened** steel is **hot rolled** into strip which leaves the last stand in the **rolling** mill at above the A1 temp., and is overaged at >400 degrees C, and then **cooled** to room temp. The strip is next cold worked to **make** an open profile, which is soln. treated and then **cooled** to obtain fine pptes. of carbides, nitrides and carbonitrides.

The **hot rolled** sheet or strip is pref. wound into a **coil** which is overaged during **cooling**; or furnace **cooling** can be used to **produce** overageing. The open profile is pref. welded to **mfr**. tube, which is soln. treated above the AC3 **temp**. while being stretch-**reduced**, then tempered during **cooling**, at 500-600 degrees C.

Useful in the **mfr**. of tubes via high-frequency welding, to obtain the above mechanical properties without **hardening** and tempering. The **prods**. are used in motor cars, hydraulic cylinders, tall steel structures or petroleum drilling.

FS CPI
FA AB
MC CPI: M24-D02

L134 ANSWER 1 OF 13 WPIX (C) 2002 THOMSON DERWENT
AN 2001-517388 [57] WPIX
DNC C2001-154846
TI Cold **rolled steel sheet** for composite moldings for vehicle panel, contains preset amount of nitrogen, niobium, titanium, phosphorus, sulfur, sol.aluminum, carbon, silicon, manganese and satisfies preset condition.
DC M24 M27
PA (NIKN) NKK CORP
CYC 1
PI JP 2001152286 A 20010605 (200157)* 9p C22C038-00
ADT JP 2001152286 A JP 1999-335019 19991125
PRAI JP 1999-335019 19991125
IC ICM C22C038-00
ICS C21D009-46; C22C038-14
AB JP2001152286 A UPAB: 20011005
NOVELTY - Cold **rolled steel sheet** contains (in weight%) nitrogen (0.0020 or less), niobium (0.010-0.040), titanium (0.003-0.035), phosphorus (0.025 or less), sulfur (0.015 or less), sol.aluminum (0.01-0.06), carbon (0.0020 or less), silicon (0.05 or less), manganese (0.05-0.35).

DETAILED DESCRIPTION - Cold **rolled steel sheet** has excellent combined formability and contains (in weight%) nitrogen (0.0020 or less), niobium (0.010-0.040), titanium (0.003-0.035), phosphorus (0.025 or less), sulfur (0.015 or less), sol.aluminum (0.01-0.06), carbon (0.0020 or less), silicon (0.05 or less), manganese (0.05-0.35) and (12Nb)/(93C)+(12Ti asterisk)/(48C)(1.3-5.2), where Ti asterisk = Ti-(48/14)N-(48/32)S. When Ti asterisk is at most 0, Ti asterisk = 0. Also, 13.9 at most r+50.0 (n) and 2.6 at most r+2.0 (n) are satisfied, where r is in-plane average r value and n is average work **hardening** exponent in the 1-10% **tensile** distortion region.

An INDEPENDENT CLAIM is also included for **manufacture** of cold **rolled steel sheet** which involves **hot rolling** a steel slab, **cooling** to the temperature of 720 deg. C or less with the run-out table **cooling** followed by **winding** at 560-660 deg. C, cold **rolling** to 70-85% and continuous annealing at 780-880 deg. C.

USE - For composite moldings for construction of motor vehicle panel, door, fender, side panel, overhang.

ADVANTAGE - The cold **rolled steel sheet** has excellent fracture resistance property, combined formability such as drawing property and overhang moldability. The molding method enables adequate control of amount of carbon in the **steel sheet** and **hot rolling**, cold **rolling** annealing conditions. A composite cold **rolled steel sheet** molding without a press crack is obtained in complicated shapes.

Dwg.0/7

TECH JP 2001152286 AUPTX: 20011005

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Composition: The cold **rolled steel sheet** contains carbon and nitrogen in a total amount of 0.0030 weight% (wt.%) or less and 2.2-4.5 wt.% of (12Nb)/(93C)+(12Tiasterisk)/(48C).

FS CPI

FA AB

MC CPI: M24-D01B; M27-B04; M27-B04A; M27-B04M; M27-B04N; M27-B04T

L134 ANSWER 2 OF 13 WPIX (C) 2002 THOMSON DERWENT

AN 2001-517387 [57] WPIX

DNC C2001-154845

TI Cold **rolled steel sheet** for composite moldings for vehicle panel, contains preset amount of nitrogen, niobium, titanium, phosphorus, sulfur, sol.aluminum, carbon, silicon, manganese and satisfies preset condition.

DC M24 M27

PA (NIKN) NKK CORP

CYC 1

PI JP 2001152285 A 20010605 (200157)* 9p C22C038-00

ADT JP 2001152285 A JP 1999-335018 19991125

PRAI JP 1999-335018 19991125

IC ICM C22C038-00

ICS C21D009-48; C22C038-14

AB JP2001152285 A UPAB: 20011005

NOVELTY - Cold **rolled steel sheet** contains (in weight%) nitrogen (0.0020 or less), titanium (0.025-0.045), phosphorus (0.025 or less), sulfur (0.01 or less), sol.aluminum (0.01-0.06), carbon (0.0020 or less), silicon (0.05 or less), manganese (0.05-0.35).

DETAILED DESCRIPTION - Cold **rolled steel sheet** has excellent combined formability and contains (in weight%) nitrogen (0.0020 or less), titanium (0.025-0.045), phosphorus (0.025 or

less), sulfur (0.01 or less), sol.aluminum (0.01-0.06), carbon (0.0020 or less), silicon (0.05 or less), manganese (0.05-0.35) and Ti asterisk /(4C)(1.4-9.2), where Ti asterisk = Ti-(48/14)N-(48/32)S. Also, 13.9 at most r+50.0 (n) and 2.6 at most r+2.0 (n) are satisfied, where r is in-plane average r value and n is average work **hardening** exponent in the 1-10% **tensile** distortion region.

An INDEPENDENT CLAIM is also included for **manufacture** of cold **rolled steel sheet** which involves **hot rolling** a steel slab, **cooling** to the temperature of 720 deg. C or less with the run-out table **cooling** followed by **winding** at 550-660 deg. C, cold **rolling** to 70-85% and continuous annealing at 780-880 deg. C.

USE - For composite moldings for construction of motor vehicle panel, door, fender, side panel, overhang.

ADVANTAGE - The cold **rolled steel sheet** has excellent fracture resistance property, combined formability such as drawing property and overhang moldability. The molding method enables adequate control of amount of carbon in the **steel sheet** and **hot rolling**, cold **rolling** annealing conditions. A composite cold **rolled steel sheet** molding without a press crack is obtained in complicated shapes.

Dwg.0/7

TECH JP 2001152285 AUPTX: 20011005

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Composition: The cold **rolled steel sheet** contains carbon and nitrogen in a total amount of 0.0030 weight% (wt.%) or less and 3-8 wt.% of Tiasterisk/(4C).

FS CPI

FA AB

MC CPI: M24-D01B; M27-B04A; M27-B04M; M27-B04T

L134 ANSWER 3 OF 13 WPIX (C) 2002 THOMSON DERWENT

AN 1997-479355 [44] WPIX

DNC C1997-152129

TI Automobile bumper **manufacture** - by feeding **steel sheet** onto conveyor system, feeding **steel sheet** through **roll** mill, **hardening** sheet, and cutting into specified lengths to bumper beams.

DC M24

IN ANDERSON, J A; BRONSEMA, B; KARY, J J

PA (ANDE-I) ANDERSON J A; (BRON-I) BRONSEMA B; (KARY-I) KARY J J

CYC 1

PI US 5669992 A 19970923 (199744)* 6p C21D008-02

ADT US 5669992 A US 1996-593393 19960130

PRAI US 1996-593393 19960130

IC ICM C21D008-02

AB US 5669992 A UPAB: 19971105

Method for **forming** a bumper beam (100) for a vehicle comprises: (a) feeding a **steel sheet** (5), having a **tensile** strength less than 80 ksi and a yield strength between 50-60 ksi, from a **coil** (12) onto a conveyor system (10); (b) feeding the **steel sheet** through a **roll** mill (19), having **roller** assemblies (20), to shape the cross-sectional area of the sheet into a bumper beam **form**; (c) **hardening** the **steel sheet** by **heat** treating then **quenching** the sheet in an inert gas chamber (24) to provide a **steel sheet** having a yield strength greater than 80 ksi and a **tensile** strength greater than 100 ksi; and (d) cutting the **steel sheet** in a cut-off device

(30) at specified lengths to provide completed bumper beams. Also claimed are methods in which the steel is cut to the specified length prior to **heat** treating, **forming** notches after **heat** treating and including the step of **heating** the completed bumper beam in a paint bake cycle at a temperature of 350 - 450 deg. F for approximately 20 minutes.

USE - In the **manufacture** of automobile bumper beams.

ADVANTAGE - The lower strength steel material is more ductile and is of lower cost than a high strength steel which allows the cold **forming** and sweeping functions to be easier with reduced occurrence of fractures in the steel. The lower strength steel material allows for a higher sweep of the bumper to be attained so that less foam filler is required to protect the engine and its components from impact. The process **produces** a bumper beam having a higher yield and **tensile** strength than bumper beams **manufactured** in the prior art.

Dwg.2/3

FS CPI
FA AB; GI
MC CPI: M24-D01; M24-D02

L134 ANSWER 7 OF 13 WPIX (C) 2002 THOMSON DERWENT
AN 1991-009639 [02] WPIX
DNC C1991-004229
TI **Heat** treatment cycle for low carbon, aluminium killed **steel sheet** - by cold **rolling** and galvanising involving **heating** above recrystallisation **temp.** and **redn.** in **reducing** atmos..
DC M13 M24
IN AKISUE, O; KATAYAMA, T; OSHIMI, M; USHIODA, K; YOSHINAGA, N
PA (YAWA) NIPPON STEEL CORP
CYC 6
PI EP 406619 A 19910109 (199102)*
R: DE FR GB
JP 03111547 A 19910513 (199125)
JP 03243750 A 19911030 (199150)
US 5074924 A 19911224 (199203)
JP 07057903 B2 19950621 (199529) 13p C23C002-06
ADT EP 406619 A EP 1990-111661 19900620; JP 03111547 A JP 1989-213013 19890821; JP 03243750 A JP 1990-38174 19900221; US 5074924 A US 1990-541732 19900621; JP 07057903 B2 JP 1989-213013 19890821
FDT JP 07057903 B2 Based on JP 03111547
PRAI JP 1989-158734 19890621; JP 1989-213013 19890821; JP 1990-38174 19900221
REP 4.Jnl.Ref; DE 2712416; EP 360958; JP 51149130; JP 54046139; JP 56116865; JP 60251226
IC C21D006-02; C21D008-04; C21D009-52; C22C038-00; C23C002-06
ICM C23C002-06
ICS C21D006-02; C21D008-02; C21D008-04; C21D009-46; C21D009-52; C22C038-06; C23C002-28
AB EP 406619 A UPAB: 19930928
A time-temp. cycle used in a continuous galvanising line in which a low carbon, Al killed cold **rolled steel sheet** is subject to the following steps: (1) **heated** at a **temp.** not **lower** than the recrystallisation **temp.**; (2) the surface is reduced in a reducing atmos.; (3) **cooled** to 230-300 deg. C for a **temp.** not **lower** than 600 deg. C at 50-120 deg. C/sec.; (4) held at this temp. for no longer than 1-5 secs.; (5) **heated** to 430-500 deg. C at a **heating** rate of 20-100 deg. C/sec.; (6) galvanised by immersing in a molten zinc bath; (7)

heated to 280-360 deg. C and subject to an overaging treatment for more than 40 secs. from 250-320 deg. C.

The zinc coating layer may be alloyed with the steel substrate by reheating to 480-600 deg. C. The **steel sheet** may be obtained by **hot rolling** a steel slab contg. 0.01-0.02%, less than 0.3% Si, 0.03-0.15% Mn, less than 0.02% P, less than 0.015% S, 0.04-0.10% Al and less than 0.003% N.

ADVANTAGE - A galvanised **steel sheet** free from **strain**-aging, bake **hardenable**, press formable and of good surface quality.

0/5

ABEQ US 5074924 A UPAB: 19930928

Prodn. of non-aging galvanised **steel sheet** involves **heating** a low C, Al-killed cold **rolled** **steel sheet** at not **lower** than recrystallising **temp**., **reducing** surface of **steel sheet** **heated** in a reducing atmos.; **cooling steel** **sheet** to temp. (TE) of 200-350 deg.C from 600 deg.C or more at a rate of 30 deg.C/s or more, holding **steel sheet** at temp. (TE) for 0-10 secs.; reheating sheet to 430-500 deg.C at 10 deg.C/s; immersing sheet into molten Zn bath; **cooling** to 370 deg.C; and subjecting sheet to overaging treatment to 250-320 deg.C for 40 secs. or more.

Obtd. **prod**. contains 0.01-0.02 wt.% C, 0.3 wt.% Si; 0.03-0.15 wt.% Mn, 0.02 wt.% P, 0.015 wt.% S, 0.04-0.10 wt.% Al and 0.003 wt.% N, the remainder being Fe and impurities. Temp. satisfies following relationship: ST=950 deg. to 7 Mn/s + 1050 deg.C. Slab is **hot** **rolled** with finishing **temp**. not **lower** than Ar3, **coiled** at 600-700 deg.C and cold **rolled**.

ADVANTAGE - Non-aging **steel sheets** havee good formability with high **prodn**. efficiency, in a continuous galvanising line of in-line annealing type.

FS CPI
FA AB
MC CPI: M13-A; M24-D02D

L134 ANSWER 9 OF 13 WPIX (C) 2002 THOMSON DERWENT
AN 1988-093353 [14] WPIX
DNC C1988-041843
TI Continuously annealed **steel sheet** for motor vehicle body - contg. related amts. of nitrogen and phosphorous for good press-**forming** and bake-**hardening** properties.
DC M24 M27
IN KINOSHITA, M; NISHIMOTO, A; SAKAMOTO, A; URABE, T
PA (NIKN) NIPPON KOKAN KK; (NIKN) NKK CORP
CYC 8
PI EP 262874 A 19880406 (198814)* EN 19p
R: DE FR GB
JP 63083230 A 19880413 (198821)
US 5078809 A 19920107 (199205)
JP 05055586 B 19930817 (199335) 21p C22C038-00
KR 9305892 B1 19930625 (199425) C21D009-46
CA 1332520 C 19941018 (199442) C21D008-04
ADT EP 262874 A EP 1987-308489 19870925; JP 63083230 A JP 1986-229106 19860927; US 5078809 A US 1988-258481 19881017; JP 05055586 B JP 1986-229106 19860927; KR 9305892 B1 KR 1987-10779 19870928; CA 1332520 C CA 1987-547908 19870925
FDT JP 05055586 B Based on JP 63083230
PRAI JP 1986-229106 19860927
REP 1.Jnl.Ref; A3...8904; BE 901054; EP 108268; EP 171208; FR 2507625; GB

2074605; JP 59080726; No-SR.Pub
IC C21D008-02; C21D008-04; C21D009-46; C22C038-06
AB EP 262874 A UPAB: 19930923
Sheet is **made** from **steel** contg. by wt. 0.001-0.003% C, not more than 0.004% N, not more than 1% Si, 0.05-0.7% Mn, 0.03-0.2% P, not more than 0.02% S, 0.01-0.15% sol. Al and in which the parameter (%P) x (%N) is not more than 3 x 10 power(-4). Boron in an amt. of 0.0005-0.003% may also be present, as may titanium in an atomic wt. ratio Ti/N of not more than 1. When titanium is present (%P) x ((%N) - (14/48%Ti)) (all in wt.%) should be not more than 3 x 10 power(-4) and when both titanium and boron are present (%P) x ((%N) - (14/11%B) - (14/48%Ti)) should be not more than 3 x 10 power(-4) with B/N + Ti not more than 1.

The steel is **hot rolled** to strip and cold **rolled** with 60-95% redn. followed by continuous annealing between the recrystallisation and Ac3 temps. Pref. **hot rolling** finishes at a temp. between Ac3 and Ac3 + 100 deg. C, and the strip is **coiled** at 750 deg. C or less.

USE/ADVANTAGE - Motor vehicle bodies. Steels with **tensile** strength of 35-45 kg/mm2 and good press-**forming**, anti-ageing and bake-**hardening** properties are obtd. using a continuous annealing process at **low temp**.

0/12
ABEQ US 5078809 A UPAB: 19930923
High strength **steel sheets** are **produced** from slabs containing (%) 0.001-0.003 C, up to 0.004 N, up to 1.0 Si, 0.05-0.7 Mn, 0.03-0.2 P, upto 0.02S, 0.01-0.15 sol Al, sufficient Ti to give a Ti/N ratio of up to 1.0, balance Fe, with the proviso that P x (N-14/48 Ti) is up to 3x10 power minus 4. The slabs are **hot rolled** at a finishing temp. between Ar3 to AR3 + 100 deg. C before boiling at a temp. up to 750 deg.C.

Finally the sheets are cold **rolled** with a reduction at 75-95% before continuously annealing the cold **rolled** sheets at a recrystallisation temp. up to the Ac3 transformation point temp.

ADVANTAGE - The sheets have good bake-**hardenability** and press formability. They are thus esp. suitable for use in the **fabrication** of automobile bodies.
ABEQ JP 93055586 B UPAB: 19931119
Steel including 0.001-0.003% C, less than 0.004% N and 0.03-0.20% P with (PxN) less than 3 x 10 power (-4)%, is **hot-rolled** at finish temp. Ar3-(Ar3+100 deg.C), **coiled** at below 750 deg.C, cold-**rolled** in the draft of 60-95%, and continuous-annealed at within the range of above recrystallisation temp. to below Ac3 point. (J63083230-A)
Dwg.0/0
FS CPI
FA AB
MC CPI: M27-B04; M27-B04A; M27-B04M; M27-B04P

L134 ANSWER 10 OF 13 WPIX (C) 2002 THOMSON DERWENT
AN 1985-214416 [35] WPIX
DNC C1985-093488
TI Age **hardenable** steel with good paint baking properties - has phosphorus content related to carbon content and is given specified box annealing treatment.
DC M24 M27
PA (KAWI) KAWASAKI STEEL CORP
CYC 1
PI JP 60138017 A 19850722 (198535)* 6p
ADT JP 60138017 A JP 1983-244509 19831227

PRAI JP 1983-244509 19831227
IC C21D008-02; C21D009-46; C22C038-06
AB JP 60138017 A UPAB: 19930925
Steel slab contains by wt. C 0.05-0.120%, Mn 0.10-1.0%, sol. Al below 0.100%, and P in an amt. according to C and meeting the relation. P = 0.03 to (0.6C + 0.03). It is **hot-rolled**, **coiled** at below 600 deg. C, pickled, cold-**rolled** and box-annealed. This **produces** an Al (ageing index) less than 1.0 kgf/mm2 and TS (**tensile** strength) more than 35 kgf/mm2. The box annealing is performed at a soaking temp. within the range of above recrystallisation temperature to below 700 deg. C with **cooling** at a rate of less than 20 deg. C/hr.
ADVANTAGE - The **steel sheet** is excellent in press-formability without **producing** creases or stretcher **strains** even if bake-painted by **heating** to about 280 deg. C due to rise of or by yield point, with the low Al value maintained.
0/2
FS CPI
FA AB
MC CPI: M27-B04; M27-B04A; M27-B04M; M27-B04P

L134 ANSWER 11 OF 13 WPIX (C) 2002 THOMSON DERWENT
AN 1983-43131K [18] WPIX
DNC C1983-042044
TI Paint curable galvanised **steel sheet** - includes small amts. of vanadium and/or niobium and is **cooled** at predetermined rate after galvanising.
DC M24 M27
PA (SUMQ) SUMITOMO METAL IND LTD
CYC 1
PI JP 58052431 A 19830328 (198318)* 3p
PRAI JP 1981-148421 19810919
IC C21D008-02; C21D009-46; C22C038-12; C23C001-02
AB JP 58052431 A UPAB: 19930925
Steel consists in % of C 0.003-0.020, S below 0.30, Mn 0.05-0.60, acid soluble Al below 0.08, P below 0.130, additionally V below 0.05 and/or Nb below 0.05, and the balance Fe with incidental impurities. It is **hot-rolled** at a finish temp. above the Ar3 point, **coiled** at below 780 deg.C, cold-**rolled** to a draft of more than 40%, **heated** to above recrystallisation temp., galvanised, alloyed with the Zn, and **cooled** at a rate of more than 5 deg.C/min. within the range above 300 deg.C, thereby to have the seizure-**hardened** (SIC) amount by more than 5 kg/mm2.
The seizure-**hardened** amount is improved from conventional 2-5 kg/mm3 to 7-13 kg/mm2, while the steel is decreased in **tensile** strength and increased in formability as well as weldability to provide yield stress required for the **prod**. e.g. automobile bodywork panels.
FS CPI
FA AB
MC CPI: M27-A01; M27-A04

L134 ANSWER 12 OF 13 WPIX (C) 2002 THOMSON DERWENT
AN 1982-12746E [07] WPIX
TI High strength cold **rolled steel sheet** for vehicle bodywork panels - has specified combined total of carbon and phosphorus, is free of silicon, and is **heat** treated.
DC M24 M27
PA (YAWA) NIPPON STEEL CORP
CYC 1

PI JP 57002841 A 19820108 (198207)* 7p
JP 60046165 B 19851015 (198545)
ADT JP 57002841 A JP 1980-76158 19800606
PRAI JP 1980-76158 19800606
IC C21D008-04; C21D009-48; C22C038-06
AB JP 57002841 A UPAB: 19930915
Prodn. is described of a high strength cold-**rolled** **steel sheet** having high 'bake-**hardenability**' and excellent in ageing resistance and press workability, in continuous annealing, The steel consists of C 0.045-0.150%, Mn 0.08-0.70%, P max. 0.13%, with C+P max. 0.17%, Al 0.020-0.080%, and the balance Fe with incidental impurities.

It is **hot-rolled**, **coiled** at above 630 deg.C, cold-**rolled** and continuously annealed. It is held at 700-900 deg.C for 10 sec. to 2 min., **cooled** within the range 650-520 deg.C at a rate of more than 40 deg.C/sec., and further **cooling** stopped at above 300 deg.C while being overages at within 300-500 deg.C for more than 30 sec.

Sheet has a **tensile** strength 35-45 kg/sq.mm.

FS CPI
FA AB
MC CPI: M27-B04